Annual Engineering Report No. 2

RESILIENT MOUNTINGS FOR RECIPROCATING AND ROTATING MACHINERY

15 June 1949 to 14 June 1950

Contract N7-onr-32904

Sponsored by

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Department of the Navy
at
Mechanical Engineering Department
Illinois Institute of Technology
Technology Center
Chicago, Ill.

Dated: 14 June 1950

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NOMENCLATURE AND LETTER SYMBOLS

In the tabulation below are the letter symbols used throughout this report. Wherever feasible, the letter symbols proposed in the American Standard ASA Z10.3-1948 have been used. These standard symbols are indicated by an asterisk.

g	*Acceleration, gravitational
A	Amplification factor, x_o / x_{st}
ω	*Angular velocity; circular frequency ($2\pi f$)
ω_n	Angular velocity; natural undamped
ω_{nd}	Angular velocity, natural damped
ω_{ra}	Angular velocity, maximum forced amplitude
ω_{rt}	Angular velocity, maximum transmissibility
c	*Damping coefficient, velocity
c_c	Damping coefficient, velocity, critical
ρ	Damping ratio, c/c_c
x	Displacement
x_o	Displacement, maximum
x_{st}	Displacement, static
δ	*Elongation; deflection
F	*Force
F_o	Force, maximum
f	*Frequency
f_n	Frequency, natural
Z	Impedance, velocity
Z_m	Impedance, mechanical
m	*Mass

T	*Period
ϕ	*Phase angle
k	*Stiffness (spring constant) and modulus
k_{st}	Stiffness or modulus, static
k_{dy}	Stiffness or modulus, dynamic
γ	Stiffness or modulus ratio, k_{dy}/k_{st}
ϵ	Transmissibility
v	*Velocity, linear
η	Viscosity, internal, coefficient of
W	*Weight

SECTION I

ABSTRACT

Section I

Abstract

The work described in this report was sponsored by the Office of Naval Research under contract N7-onr-32904 and was accomplished between 15 June 1949 and 14 June 1950. The purchased and fabricated equipment was assembled in the Mechanical Engineering Department of Illinois Institute of Technology, where all of the work was done.

A test procedure was developed to determine the static and dynamic characteristics of resilient mountings, forty-six of which were tested completely on this contract.

From the data obtained at resonance, the dynamic stiffness, and damping ratio of each mounting were determined. The static stiffness and set were determined from static tests. The transmissibility of each mount was measured over the frequency range of approximately 2 to 10,000 cps. Values of the damping ratio c/c_c and the ratio of dynamic to static stiffness were determined and found to be within the range of values determined by other observers for the same materials.

The test results are given in tabular and graphical form and all the pertinent data obtained are included in each form. The test results indicated deviations from vibration isolation theory in that at certain high frequencies within the audio-frequency range some isolators do not give the degree of isolation expected and may even act as amplifiers. The metal spring types exhibited this phenomenon to a marked degree.

SECTION II

TEST EQUIPMENT AND PROCEDURE

Section II

Test Equipment and Procedure

Test Equipment:

The main items of equipment used in conducting the tests described under Test Procedure are given in the list that follows:

1. Electronic Voltmeter, Ballantine, Model 300 AC

   Voltage Range: 1 millivolt to 100 volts

   Frequency Range: 10 to 150,000 cps

   Operating Voltage: 110-120 V @ 60 cycle

   Zero db level at 1 millivolt

   Input Impedance 500,000 ohms

2. Decade-Amplifier, Ballantine M-220

   Amplifications Range: 10X or 100X

   Frequency Range: 10 to 100,000 cps

   Battery Life: 150 hrs.

3. Cathode Ray Oscillograph, Du Mont, Type 250

   Operating Voltage 115 or 230 V @ 50-60 cps

   Amplifier response, both vertical and horizontal, within 10% from 5 to 200,000 cps

   Type 5 CP-A Cathode-ray Tube

4. Vibration Exciter and Accessories, MB Model S 1.

Components:

1. Model S 1 Exciter

   25 lb. force min. 4 cps to 500 cps

   $\frac{1}{8}$ inch total travel

2. Power Supply, 115VAC @ 60 cps

   a. Model P 11 Electronic Amplifier and Power Supply

   b. Model A 20 Audio Oscillator - Frequency Range
      2 to 70,000 cps.

   c. Model F 31 D.C. Field Supply
      and Ammeter. 115 V. D.C., 250 W

3. Connecting Cables

5. Vibration Measurement System, Massa Model GA - 1006

Components: 1 - Model M-117 Accelerometer

1 - Model M-114A Pre-amplifier

1 - Model M - 116A Power Supply Unit

Accelerometer Response: (At end of pre-amplifier cable, using mounts and cables made especially for these tests)

Uniform, 0.06 volts (peak) per g from about 10 to 20000 cps

Electronic Impedance:(Of accelerometer only) 180 mmf

Accelerometer resonant frequency: 23 KC

6. Dial Indicators, Chicago Dial Indicator Co.

   a. For Low Frequency Vibration Measurements

      Type: Geneva Dial Gauge No. 125F

      Range 1/8 inch by 0.0005 in.

   b. For Static Deflection test

      Type: Geneva Dial Gauge No. 125F

      Range 1/5 inch by 0.001 in.

Test Procedure

After considerable investigation and experimentation it was found that the test set-up shown in the block diagram (Figure II-1) and the accompanying photographs (Plates II-1 and II-2) permitted the greatest flexibility as to load and frequency ranges. The particular set-up shown in Plate II-I is typical of the manner in which the isolators were mounted, although the actual details of the suspension system varied with the individual resilient mountings.

The various steps in the actual test procedure were as follows:

Step 1. A test weight was chosen to load the isolator within its recommended load range.

Step 2. The supporting springs were chosen to give a deflection within their design range of 5 to 15 inches and the supporting rods were adjusted to position the support platform at the proper height above the driver.

Step 3. The accelerometers were attached as follows:

a. The upper accelerometer on or in the weight coincident with its vertical axis.

b. The lower accelerometer at the center of the support platform.

Step 4. The isolator was securely attached either to the support platform or weight, the choice being determined by the isolator configuration. The weight was then supported directly above the support platform, either by hand in the case of the lighter weights or by a hoist for the larger ones. The isolator, weight, and platform were then securely fastened together and lowered until the springs supported the system. Guy wires were employed to keep the system stable.

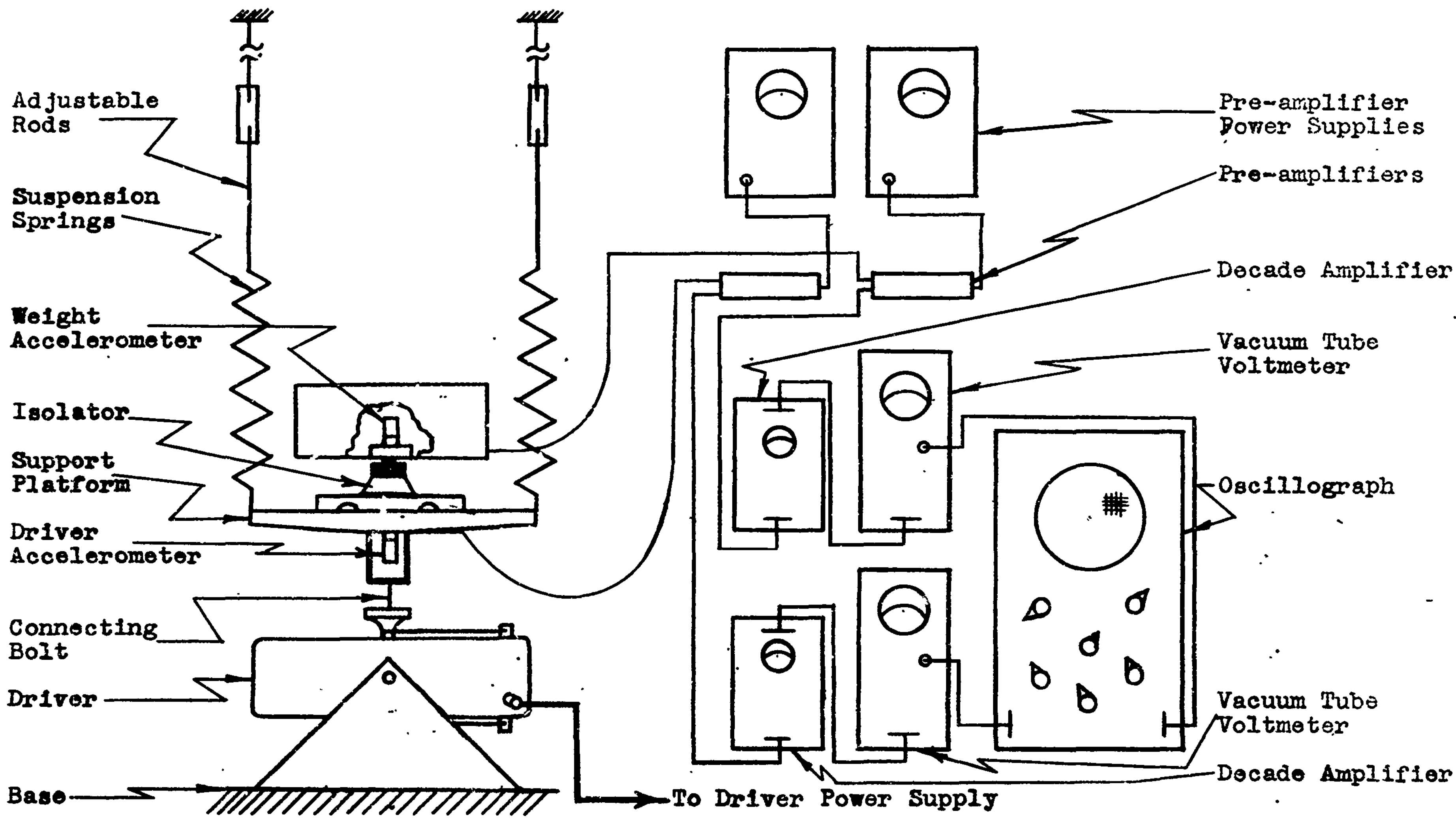

FIGURE II-1
Block Diagram of Complete Test Set-up.

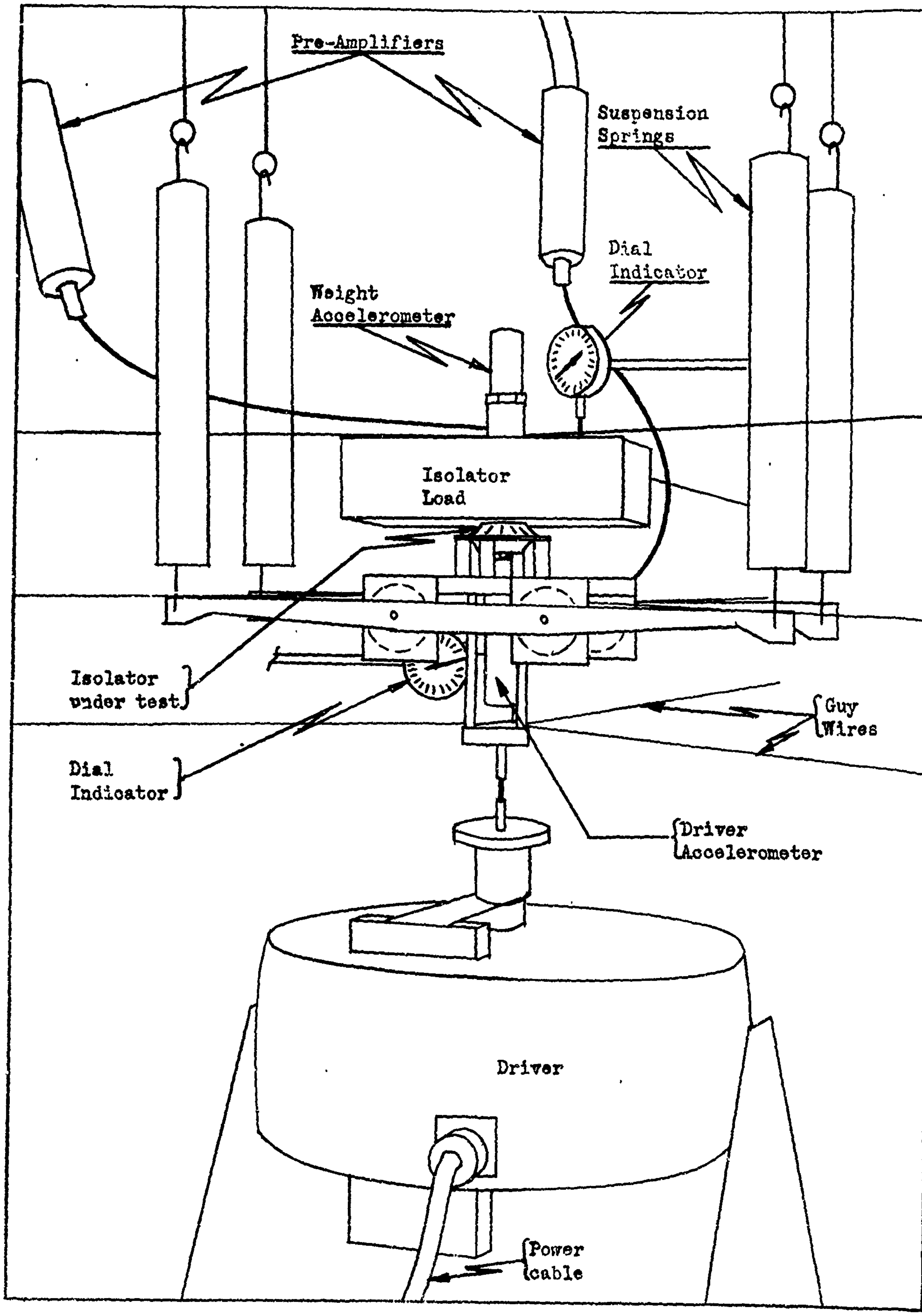
Pre-Amplifiers
Suspension Springs
Dial Indicator
Weight Accelerometer
Isolator Load
Isolator under test
Guy Wires
Dial Indicator
Driver Accelerometer
Driver
Power cable

Plate II-1

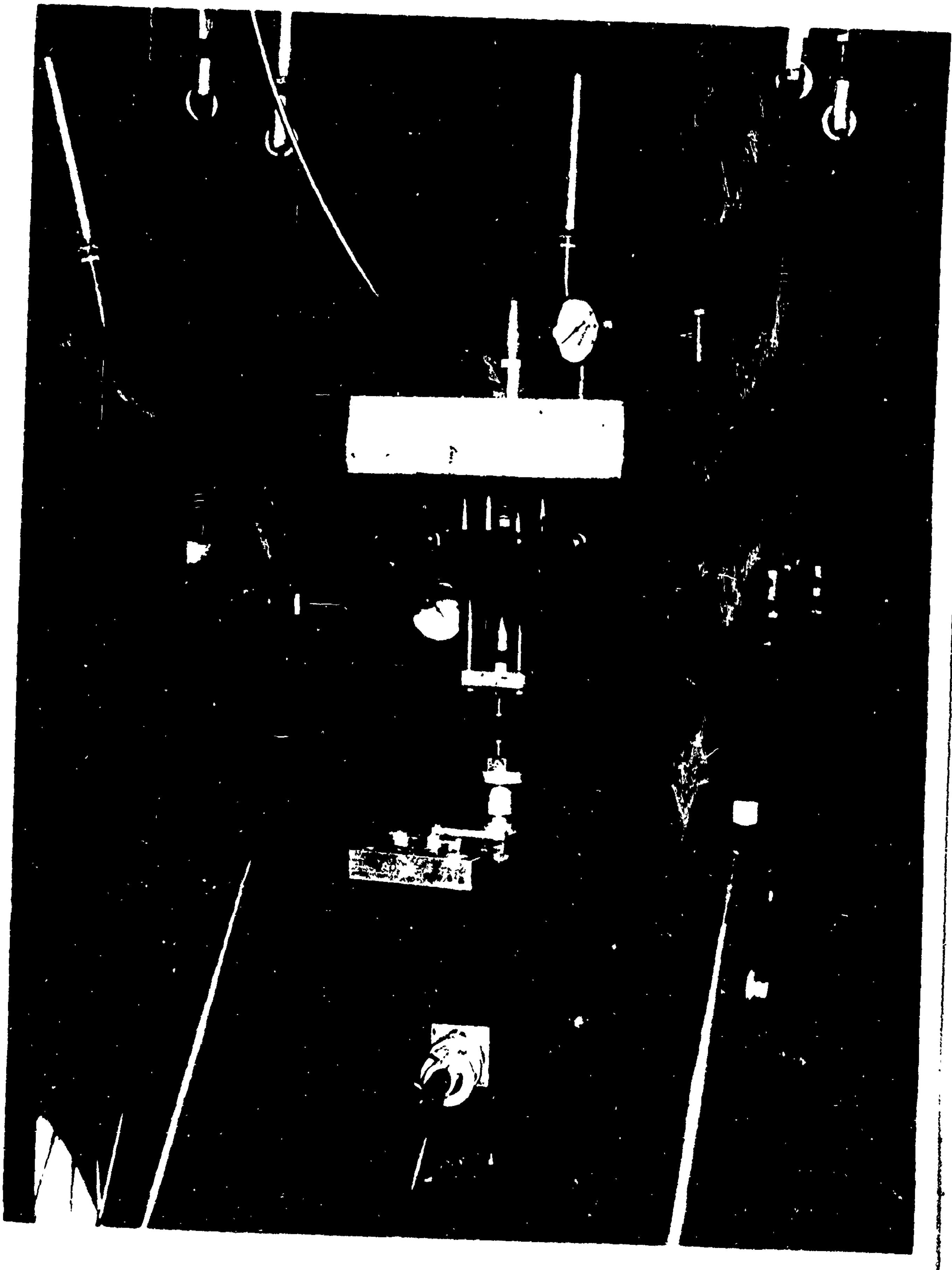

PLATE II-1

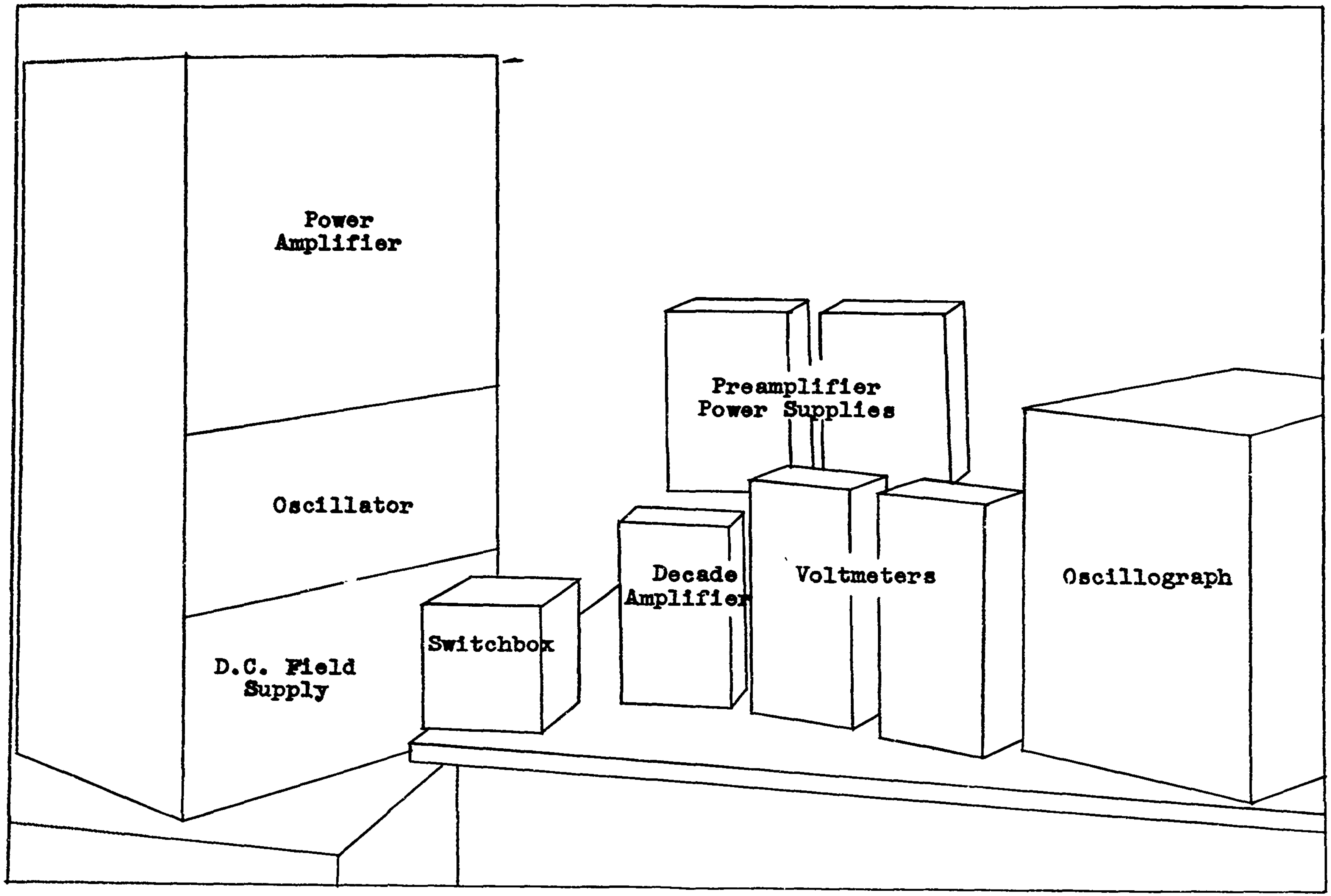
Power Amplifier
Oscillator
D.C. Field Supply
Switchbox
Decade Amplifier
Preamplifier Power Supplies
Voltmeters
Oscillograph

Plate II-2

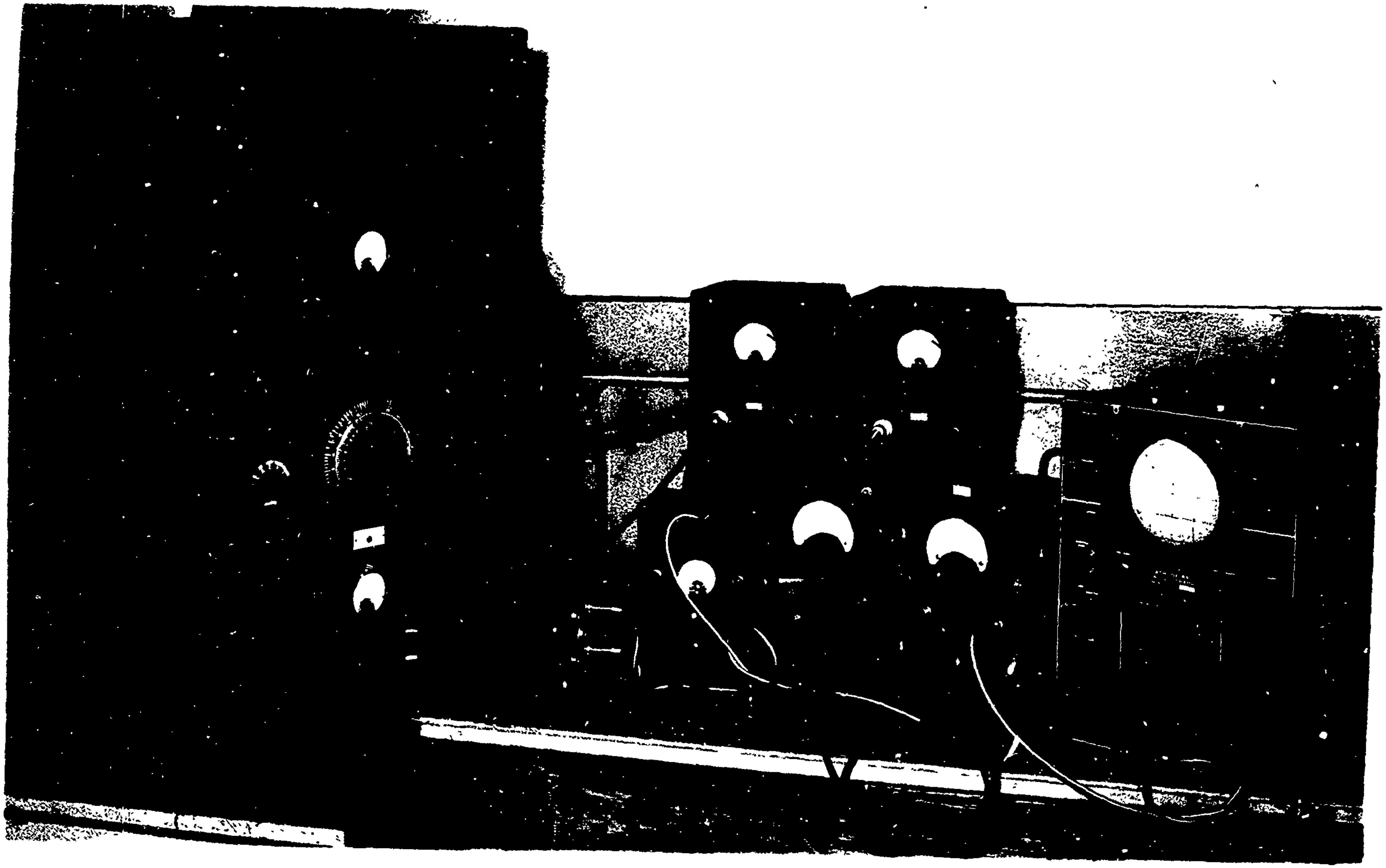

PLATE II-2

Step 5. The tension in the guy wires was adjusted by means of U-bolts so that the weight and support platform were level and the longitudinal axes of the weight, isolator, support platform, and accelerometers were coincident with the axis of excitation.

Step 6. The entire system was attached to the driving head by means of a threaded flexure rod.

Step 7. Since the accelerometer response falls off below 10 cps, between 2 and 10 cps measurements were made with two dial indicators, one measuring the movement of the weight and the other the movement of the support platform. They are shown in typical positions in Plate II-1. The following data were obtained in this frequency range:

a. Frequency of the driver

b. Amplitude of the support platform

c. Amplitude of the weight

Step 8. At the lowest practicable frequency value, usually about 8 to 10 cps, the accelerometers were used to measure the movements of the weight and the support. The data taken were as follows:

1. Frequency (cps)
2. Acceleration of support
3. Acceleration of weight
4. Decibel loss or gain across the isolator
5. Noise level of the electronic equipment (db).

The electronic equipment used to measure the required accelerations is shown in Plate II-2. Actually, the accelerations were not taken directly, since the measurements were of the voltages generated by the

crystal accelerometers. However, since the calibration constants of the accelerometers were almost equal over the test frequency range (see the calibration curves in Figures II-2, -3, -4, -5), the ratio of voltages was assumed to be equal to the ratio of accelerations, that is,

$$\frac{E_1}{E_2} = \frac{\ddot{x}_1}{\ddot{x}_2}$$

The decibel readings were taken with a datum of zero decibels at one millivolt across 500,000 ohms. The oscillograph was used each time a voltage measurement was made to insure that the motion of the support and the weight were sinusoidal. Also, it was used to determine the exact value of the resonant frequency and to determine the presence of resonances at high frequencies. The latter was accomplished by observing the behavior of Lissajou figures at, and in the neighborhood of, the frequency values in question. Before each test, the noise level of the electronic equipment was determined and recorded.

During the test, at frequency values above resonance, the output of the power amplifier was increased until the voltage generated in the accelerometer in the weight was at least 10 db above the noise level of the instruments. At or near resonance, the output was regulated so that the voltage from the accelerometer on the support was at least 10 db above the noise level. Thus, all readings were at least 10 db above the noise level from both accelerometers over the entire frequency range. This minimized the possible error due to inherent noise in the electronic system.

Step 9. A static test of each isolator was made in order to determine the static stiffness of the isolators. This test consisted of applying a gradually increasing load through the load range of

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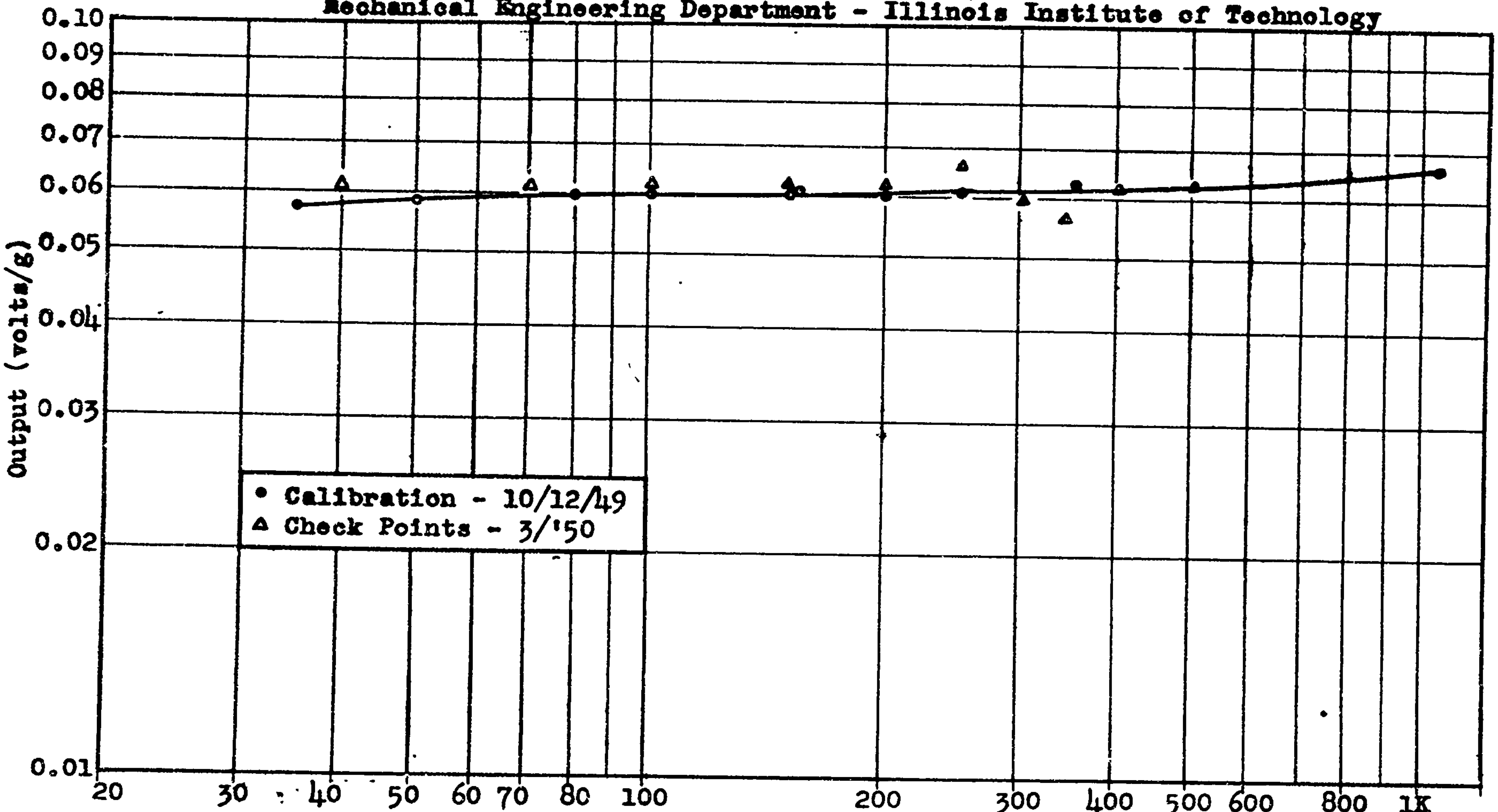

Frequency (cps)

Figure II-2

Massa Accelerometer System No. 127

Modified to Include Threaded Brass Adapter and Associated Input Cable

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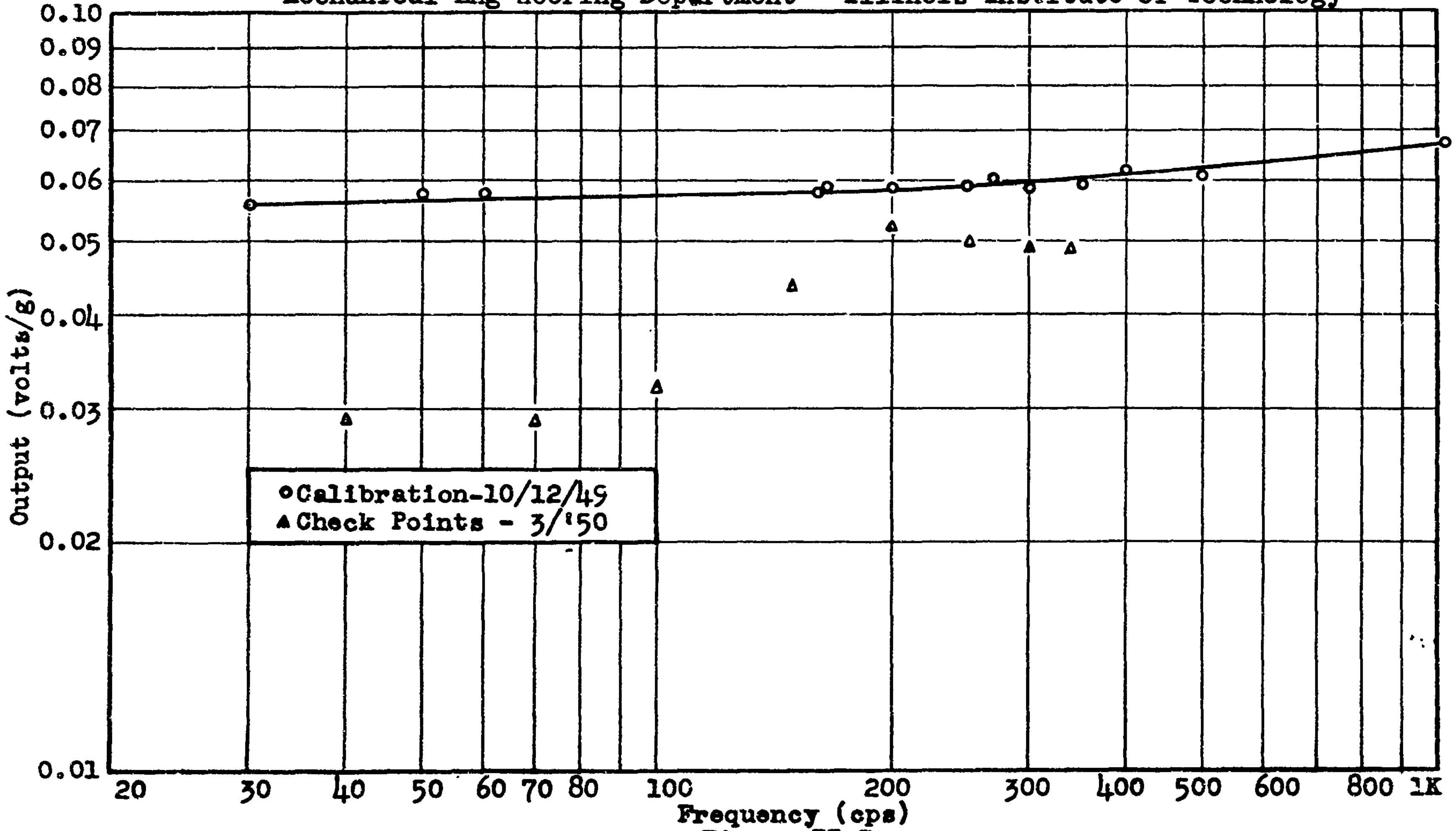

Figure II-3

Massa Accelerometer System No. 129

Modified to Include Threaded Brass Adapter and Associated Input Cable

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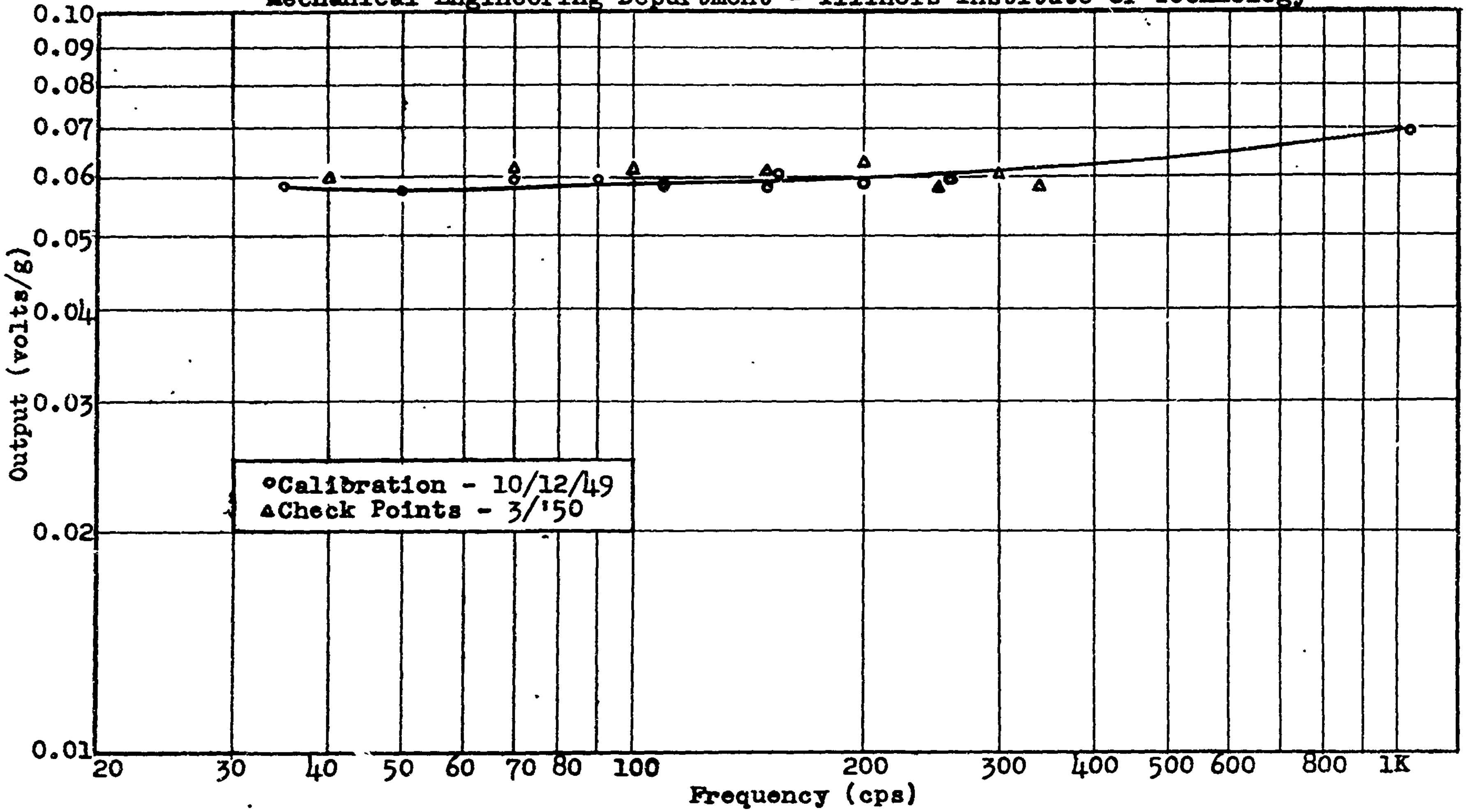

Figure II-4
Massa Accelerometer System No. 131
Modified to Include Threaded Brass Adapter and Associated Input Cable

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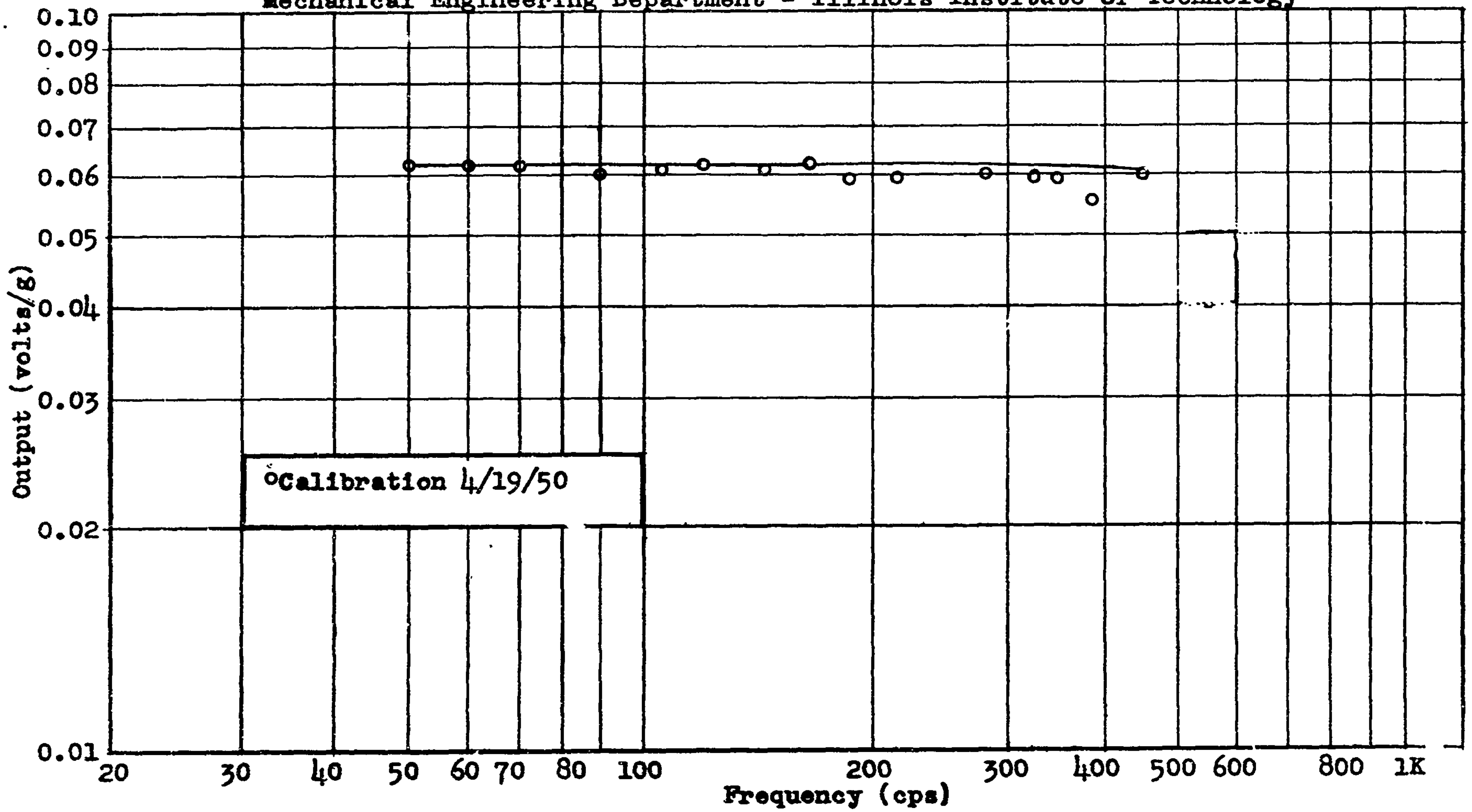


Figure II-5
Massa Accelerometer System No. 148
Modified to Include Threaded Brass Adapter and Associated Input Cable

the isolator and making concurrent deflection measurements at each load change. After each increase in the load enough time was allowed for the isolator to come to an equilibrium position before a deflection measurement was made, that is, deflection measurements were made only after flow in the rubberlike material had virtually ceased.* At the completion of the static test, the amount of set was measured, and its deterioration with time recorded.

Although it has been well established that most of the physical properties of rubberlike materials are temperature dependent to some degree, no attempt was made to control the temperature of testing. All of the tests were conducted at room temperature which varied from approximately 65°F to 80°F, with a mean value of about 72°F. The static and dynamic moduli and the hysteresis losses of the rubber are comparatively insensitive to a temperature change of this magnitude at room temperatures, so it was not felt that the additional equipment required to control the temperature of testing would justify the possible refinement in the data obtained.

*For a discussion of the mechanism by which this is accomplished, see Section III, "Applicable Theory", of this report.

SECTION III

APPLICABLE THEORY

Section III

Applicable Theory

The applicable theory divides itself readily into two parts, one dealing with the applicable general vibration theory and another which is concerned with the static and dynamic characteristics of the materials used as the elastic media in resilient mountings.

In considering the effectiveness of vibration isolators, it is well known that the transmissibility ϵ (defined as the ratio of the force transmitted through the isolator to the exciting force) depends not only upon the transmission characteristics of the isolator but upon the properties of the support used in conjunction with it. If the isolator is mounted upon a fixed or immovable base, (Figure III-1) then the transmissibility ϵ_0 is a function of the isolator only. Unless a test set-up could be devised that would simulate quite accurately the mass, damping, and stiffness characteristics of structures encountered in the field, it was felt that the major efforts of the project should be to furnish this value of ϵ_0. Measurement of this value of transmissibility will permit a valid comparison of the various isolators and will establish a criterion for determining their effectiveness in the field.

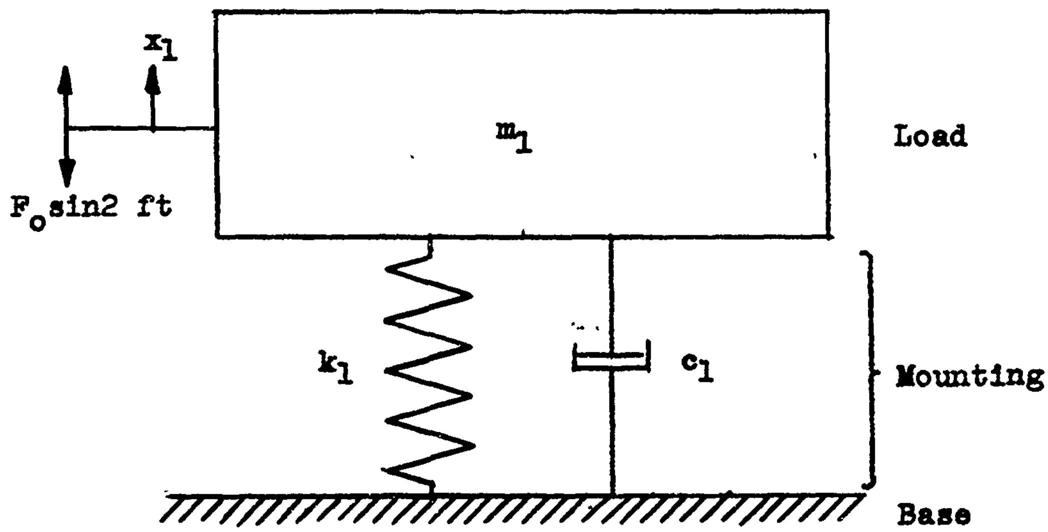


Figure III-1
Schematic Diagram of a Single Degree of Freedom System

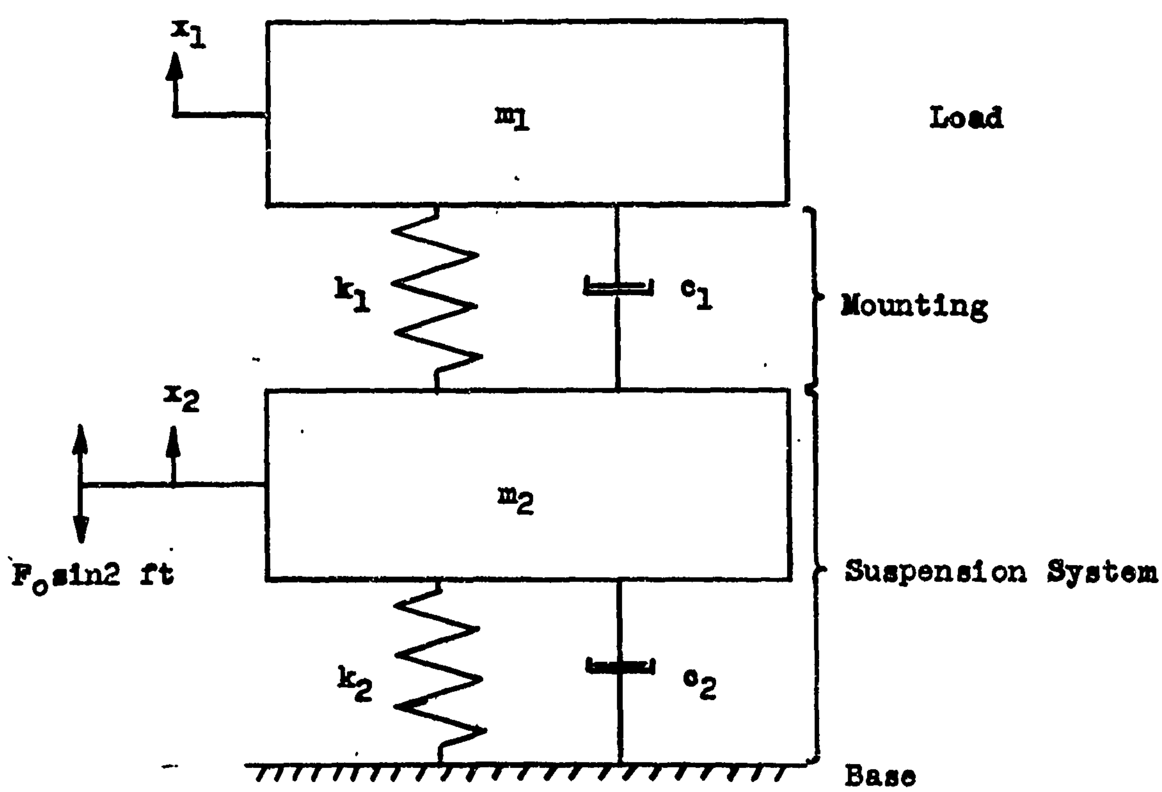


Figure III-2
Schematic Diagram of a Two Degree of Freedom System

A schematic diagram of the test set-up that was used on this project is shown in Figure III-2.* The isolator under test is represented by the stiffness k_1 and the damping resistance c_1. The mid-range load of the isolator is represented by m_1; m_2, k_2, and c_2 represent the support, which is driven by the sinusoidal forcing function $F_o \sin 2\pi ft$.

One advantage of this set-up is that the transmissibility ϵ_o, as defined in the previous paragraph can be shown to be equal to the ratio of the acceleration amplitudes, $\ddot{x}_1/\ddot{x}_2$, of the masses m_1 and m_2, respectively. As has been described in Section II, "Test Equipment and Procedure", direct measurements of the accelerations of m_1 and m_2 are made at values of the driving frequency from 10 to 10,000 cps. Below 10 cps it was necessary to follow a different procedure because the response of the accelerometers was poor. In the range from 2 to 10 cps direct readings of the amplitude of vibration were made with dial gage indicators. It will be shown that the ratio of the accelerations or amplitudes so obtained does not depend upon the support characteristics m_2, k_2, c_2, provided that the motion is sinusoidal and that the frequency is in the range in which lumped constants can be used to represent the characteristics of the system.

As was shown in Engineering Report No. 1, dated 15 June, 1949,

*In Figure III-2, the test isolator is represented by the symbol ( ). For a rubber isolator this representation is not valid in a strict sense, and should be represented by the Maxwellian symbol ( ). However, since all resilient mountings do not use rubber as the elastic medium, the first symbol will be used to simplify the notation, that is, it will designate a resilient mounting of any type. Wherever necessary, more appropriate symbols will be used.

page 18, the transmissibility of an isolator with a rigid support (Figure III-1) can be expressed as

$$\epsilon_o = \left| \frac{k_1 + jc_1\omega}{(k_1 - m_1\omega^2) + jc_1\omega} \right| \qquad (1)$$

With reference to the schematic diagram of Figure III-2, equilibrium requires that

$$x_1 (-m_1\omega^2) + (x_1 - x_2)(k_1 + jc_1\omega) = 0$$

from which

$$\frac{x_1}{x_2} = \frac{k_1 + jc_1\omega}{(k_1 - m_1\omega^2) + jc_1\omega} \qquad (2)$$

By comparing equations (1) and (2), it can be seen that the ratio of the displacements of the masses of a system with two degrees of freedom is exactly equal to the expression for the transmissibility of an isolator mounted on a rigid foundation, that is,

$$\epsilon_o = \left| \frac{x_1}{x_2} \right| \qquad (3)$$

and, since it is assumed that the motion is sinusoidal, then

$$\epsilon_o = \left| \frac{\ddot{x}_1}{\ddot{x}_2} \right| \qquad (4)$$

that is

$$\epsilon_o = \sqrt{\frac{1 + (c_1\omega/k_1)^2}{(1 - \omega^2/\omega_n^2)^2 + (c_1\omega/k_1)^2}} \qquad (5)$$

or

$$\epsilon_o = \sqrt{\frac{1 + 4\rho^2 r^2}{(1 - r^2)^2 + 4\rho^2 r^2}} \qquad (6)$$

where ρ ..... damping ratio c/c_c,

r ..... frequency ratio ω/ω_n.

The same expression can be obtained by considering the electrical analogue of Figure III-3 and equating the voltages around the circuit

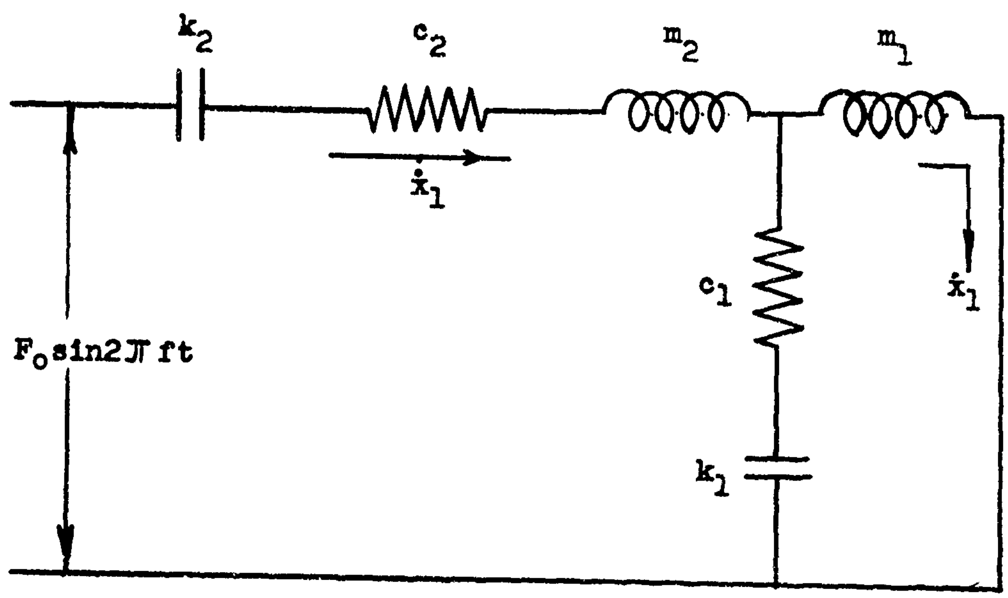


Figure III-3
Electrical Circuit Analogous to the
System Shown in Figure III-2

$(m_1 - k_1 - c_1)$ to zero.

Thus, it is seen that the transmissibility of an isolator on a rigid foundation can be determined readily in a set-up similar to that represented by Figure III-2 by direct measurement of the accelerations of the two masses. The ratio of these accelerations does not depend upon the characteristics of the support, and m_2, k_2, and c_2 can be chosen so that the system can be driven over a considerable frequency range.

The upper limit of the frequency range in which measurements can be made will depend upon the frequency at which the assumption of lumped constants is still valid and upon the fact that equation (4) is valid only for the assumption of vertical sinusoidal motion of the masses m_1 and m_2. Further, the motion of all portions of the area under the base of the isolator, where the accelerometer is attached, must be vertical, sinusoidal and in phase.

In a damped, oscillatory, single degree of freedom system which is caused to vibrate by a sinusoidal forcing function, there are four "natural" or "resonant" frequencies of importance,

1) the undamped natural frequency (ω_n)
2) the damped natural frequency (ω_{nd})
3) the frequency of maximum forced amplitude (ω_{ra})
4) the frequency of maximum transmissibility (ω_{re}).

These will be treated separately below, but it should be noted first that in an undamped system they are all coincident and equal to the value of the undamped natural frequency.

Consider the system of Figure III-1 without damping or forcing function and then with damping but no forcing function. Any standard vibrations text (16) will show that

$$\omega_n = \sqrt{k_{st}/m}$$

and

$$\omega_{nd} = \sqrt{\omega_n^2 - (c/2m)^2} \tag{7}$$

$$= \omega_n \sqrt{1 - \rho^2}$$

where k_{st} ..... static stiffness* (lb./in.)

m ..... mass of the load (slugs/12)

c ..... damping constant* (lb. sec/in.)

ρ ..... ratio of actual damping to critical damping c_c,

$(c_c = 2m\,\omega_n)$

the frequencies are in radians per second.

Define the amplification factor A as the ratio of the amplitude of the forced vibration produced by the sinusoidal load $F_o \sin \omega t$ to the magnitude of the static deflection for the same load F_o, that is,

$$A = x_o/x_{st} \tag{8}$$

where

$$x_o = \frac{F_o}{\sqrt{(m\,\omega^2 - m\,\omega_n^2)^2 + c^2\omega^2}}$$

$$x_{st} = F_o/k_{st}$$

Thus,

$$A = \frac{k_{st}}{\sqrt{(m\,\omega^2 - m\,\omega_n^2)^2 + c^2\omega^2}}$$

and

$$A = \frac{1}{\sqrt{(1 - \omega^2/\omega_n^2)^2 + (c\,\omega/k)^2}} \tag{9}$$

*The stiffness and damping constants are discussed in detail later in this section.

or

$$A = \frac{1}{\sqrt{(1 - r^2)^2 + 4\rho^2 r^2}}$$

The frequency at which A is a maximum is known as the frequency of maximum forced amplitude, or sometimes referred to as the "resonant" frequency.

By considering equation (9) it can be shown that this frequency is given by

$$\begin{aligned} \omega_{ra} &= \sqrt{\omega_{nd}^2 - (c/2m)^2} \\ &= \omega_n\sqrt{1 - 2\rho^2} \end{aligned} \qquad (10)$$

which is plotted in Fig. III-4.

The expression for the transmissibility of such a system is given by equations (5) and (6), that is,

$$\epsilon_o = \sqrt{\frac{1 + (c\,\omega/k)^2}{(1 - \omega^2/\omega_n^2)^2 + (c\,\omega/k)^2}} \qquad (5)$$

$$= \sqrt{\frac{1 + 4\rho^2 r^2}{(1 - r^2)^2 + 4\rho^2 r^2}} \qquad (6)$$

The frequency value for which equation (6) is a maximum is

$$\omega_{r\epsilon} = \frac{\omega_n}{2\rho}\sqrt{\sqrt{8\rho^2 + 1} - 1} \qquad (11)$$

Thus, the four important frequencies are

$$\left.\begin{aligned} \omega_n &= \sqrt{k_{st}/m} \\ \omega_{nd} &= \sqrt{\omega_n^2 - (c/2m)^2} = \omega_n\sqrt{1 - \rho^2} \\ \omega_{ra} &= \sqrt{\omega_{nd}^2 - (c/2m)^2} = \omega_n\sqrt{1 - 2\rho^2} \\ \omega_{r\epsilon} &= \frac{\omega_n}{2\rho}\sqrt{\sqrt{8\rho^2 + 1} - 1} \end{aligned}\right\} \qquad (12)$$

A typical value of the damping ratio for a rubber isolator is $\rho = 0.10$. Using this value in equation (12), we obtain

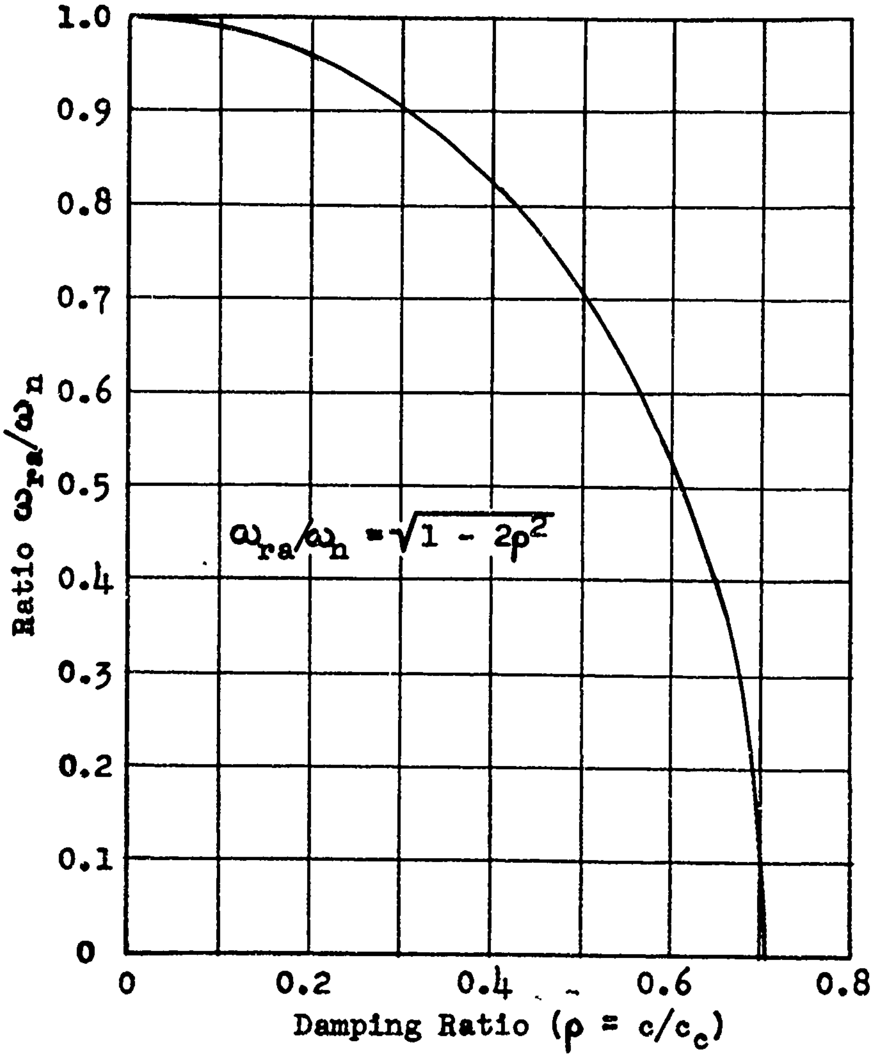


Figure III-4
Effect of Damping Ratio on the Ratio ω_{ra}/ω_n

$$\omega_{nd} = 0.99499\,\omega_n$$
$$\omega_{ra} = 0.98995\,\omega_n$$
$$\omega_{r\epsilon} = 0.99038\,\omega_n$$

This would indicate that to all practical purposes the four frequencies can be assumed equal to each other for values of ρ in this range.

In equation (12) one very important factor was implied, but not stated explicitly, that is, it was assumed that the stiffness k was constant for all loading conditions. Actually, as will be shown later in this section, stiffness values are not the same for both static and dynamic loadings. For a metallic helical spring this dynamic effect is negligible, but for a resilient mounting using a rubberlike material as the elastic medium, the effect of dynamic load is quite important and should be taken into account when considering the frequency values of equation (12).

The term decibel is used in acoustics to give a measure of the relative loudness of two sounds in terms of their sound pressures, that is,

$$db = 20 \log_{10}(P_2/P_1) \tag{13}$$

where P_1 and P_2 are the sound pressures involved. When it is desirable to compare energy levels, this decibel scale furnishes a very useful criterion of comparison. In the case of electrical circuits with the same impedance levels, equation (13) has an exact equivalent which is as follows:

$$db = 20 \log_{10}(E_1/E_2) \tag{14}$$

where E_1 and E_2 are the voltages of the two energy levels to be compared.

In our case, we have two voltages which vary directly with the

accelerations produced in m_2 and m_1 of Figure III-2. If we let E_2 and E_1 be the voltages induced in the accelerometers on m_2 and m_1, respectively, then they are related to the accelerations (a_2 and a_1) of these masses as follows:

$$\begin{aligned} E_2 &= K_2 a_2 \\ E_1 &= K_1 a_1 \end{aligned} \tag{15}$$

where K_1 and K_2 are the calibration constants of the accelerometers. In our case these constants have been found to be approximately the same, as is shown in Figures II-2, -3, -4, -5; thus, the condition that the calibration constants of the accelerometers must be equal (or very nearly equal) is satisfied, and

$$\begin{aligned} E_2 &= K a_2 \\ E_1 &= K a_1 \end{aligned} \tag{16}$$

therefore

$$\frac{E_1}{E_2} = \frac{a_1}{a_2}$$

If the condition that the forcing function be sinusoidal is satisfied as well, then for a displacement of

$$x = x_0 \sin \omega t,$$

the velocity .... $v = x_0 \omega \cos \omega t$, and (17)

the acceleration .... $a = -x_0 \omega^2 \sin \omega t$

where x_0 is the amplitude of the displacement and ω is the circular frequency of the forcing function in radians per second. Or, using $2\pi f = \omega$, where f is cps, equation (17) can be restated as

$$\begin{aligned} x &= x_0 \sin 2\pi ft \\ v &= x_0\, 2\pi f \cos 2\pi ft \\ a &= -x_0\, 4\pi^2 f^2 \sin 2\pi ft \end{aligned} \tag{18}$$

Thus, for example, by equation (18)

$$\begin{aligned} a_1 &= x_1 4\pi^2 f^2 \sin 2\pi ft \\ a_2 &= x_2 4\pi^2 f^2 \sin 2\pi ft \end{aligned} \tag{19}$$

and the ratio of accelerations, velocities, and displacements are

$$\frac{a_1}{a_2} = \frac{v_1}{v_2} = \frac{x_1}{x_2} = \frac{E_1}{E_2} \tag{20}$$

Thus, from equations (16) and (20), the transmissibility ϵ is defined as

$$\epsilon = x_1/x_2 = E_1/E_2 \tag{21}$$

The decibel change n across the isolator is related to transmissibility ϵ by equation (14) as

$$n = 20 \log_{10} \epsilon \tag{22}$$

or

$$\epsilon = 10^{n/20} \tag{23}$$

A plot of equation (23) is given in Figure III-5.

It should be noted that for frequencies in the neighborhood of the resonant frequency of the mounting, the transmissibility is greater than one and, by equation (22), the decibel change across the isolator n should be a net gain (or positive). For the higher frequency values, where the transmissibility is considerably less than one, n should be a net loss (or negative). This has been borne out very closely by our experimental data.

Since almost all the isolators tested during the course of this project used rubber, or a rubberlike material, as the elastic medium, it is entirely in order to mention a few pertinent phases of the physics of rubber elasticity; particularly, the factors, such as,

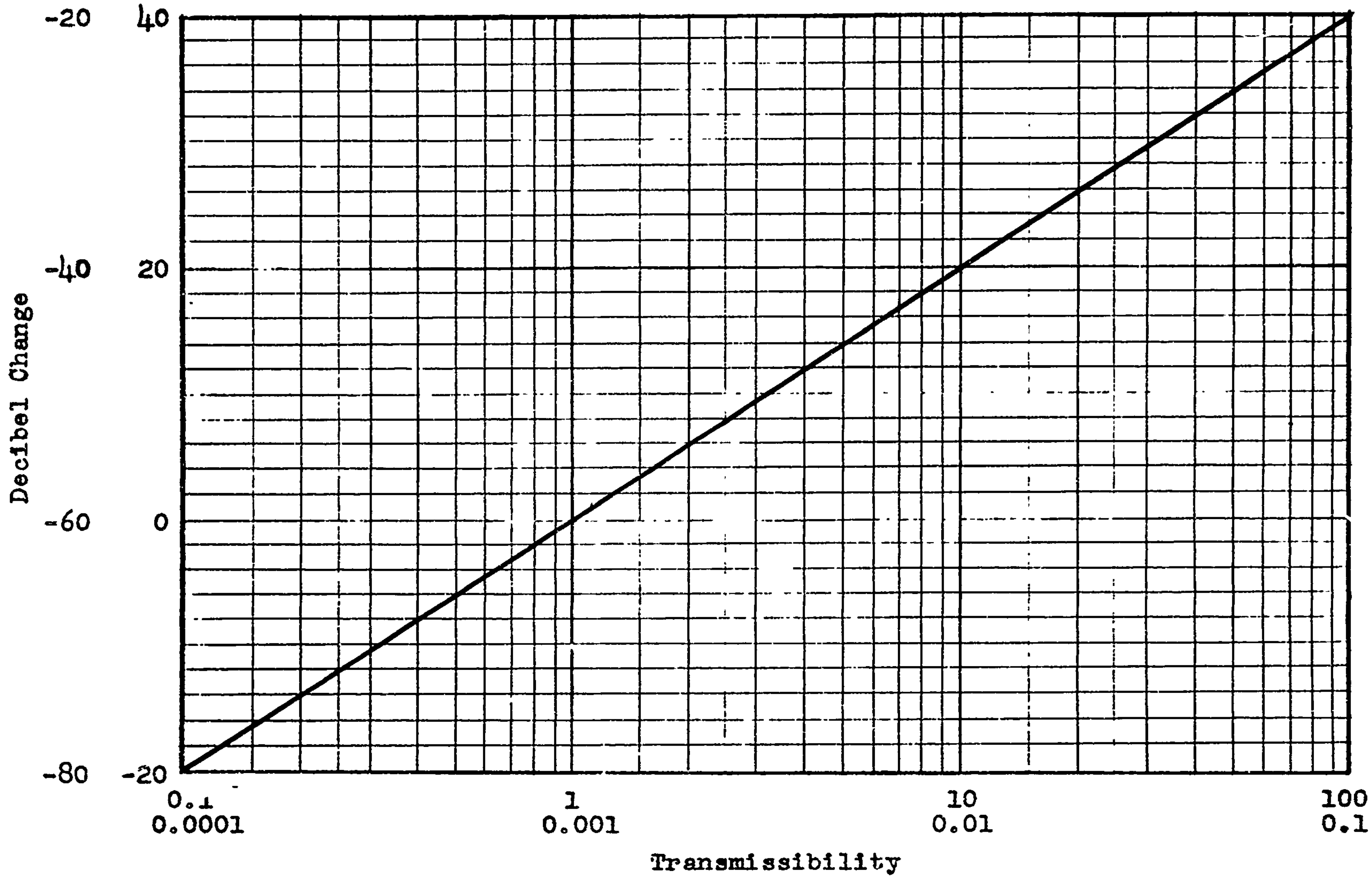


Figure III-5
Relationship between Decibel Change and Transmissibility ϵ

stiffness (static, dynamic) and damping, which effect the transmissibility materially.

Let us preface the discussion of these factors, by first establishing their definitions. Static stiffness can be defined in two ways for any point on a load deflection curve. The "cumulative static stiffness" is defined as the ratio of the applied load to the resulting deformation, and the "incremental static stiffness" as the slope of a line drawn tangent to the load-deflection curve at the point in question (see Figure III-6). It is seen quite readily then that the two definitions will give the same values of static stiffness only for a material (or elastic medium) whose behavior in the range considered is governed by a linear load-deflection law, for example a metallic helical spring, which closely approximates this ideal. However, this is not true for rubberlike materials, although some of them may display almost linear characteristics for small deformations. Thus, in this report we have used the second, more general definition:

"Static stiffness is defined as the point slope of the load-deflection curve."

In a similar manner, the static moduli can be defined; first, the cumulative static modulus is defined as the ratio of the applied stress to the resulting strain and, second, the incremental static modulus is defined as the point-slope of a stress-strain curve. Again we will use the second definition for the reasons which follow.

It should be noted that in these definitions there is the implied statement that the load-deflection curve will always be the same for any given material. However, this is not necessarily true for a rubberlike material. The strain in a specimen under test has a very

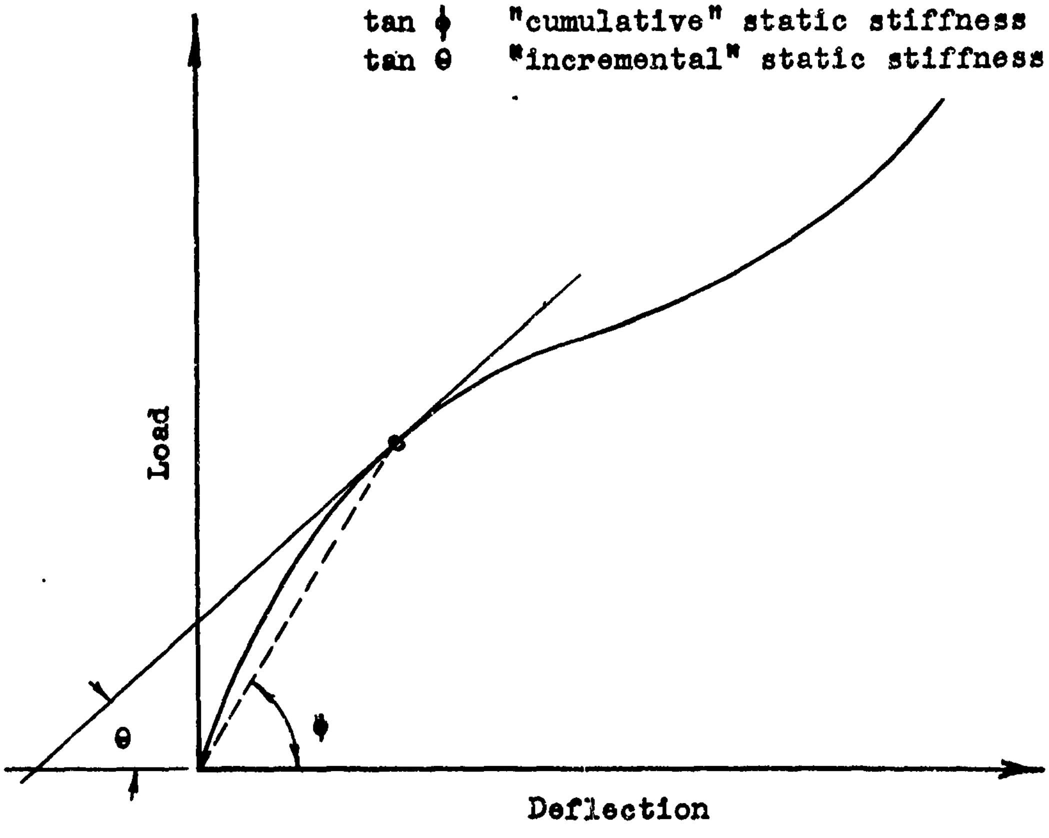


Figure III-6
Cumulative and Incremental Static Stiffness

definite bearing upon the static stiffness (or modulus) of the material, as is shown in Figure III-7. The data for these curves were taken from a paper by F. P. Baldwin (1)* and show clearly the effect of strain upon so-called "static" moduli. As was mentioned in Section II, "Test Equipment and Procedure", this effect of strain upon static stiffness is evident during a static load-deflection test.

When a rubberlike material is subjected to constant stress, such as in a load-deflection test, a portion of the internal stress is relaxed under thermal agitation and the elastic equilibrium is disturbed. Consequently, the exterior compressive stress will cause a decrease in the original length until the internal stresses have regained their original values and equilibrium is restored. As long as relaxation continues, this process will be repeated continually, and the material will flow.** Thus, it is evident that time plays an important role in the deformation processes of a rubberlike material. A deformation, which when executed quickly is completely elastic, may become plastic if executed slowly.

Thus, the so-called "static" characteristics of a rubberlike material are definitely a function of testing speed, as well as the manner in which they are defined. In our tests we permitted the isolator to establish, or nearly establish, an equilibrium position before measuring the resulting deformation. This seems to be a reasonable approach since an isolator in field use is subjected to essentially

*Numbers in parenthese refer to references given in the bibliography at the end of this section of the report.

**A complete discussion of the plasto-elastic behavior of rubber, which is beyond the scope of this report, is given in reference (2) of the bibliography.

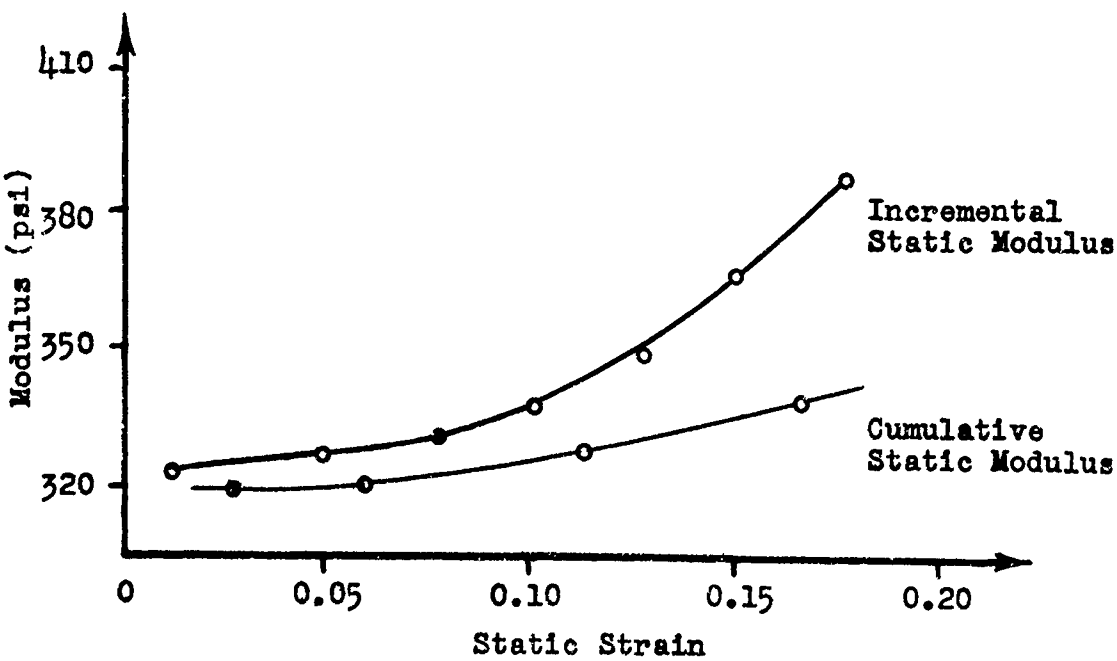


Figure III-7
Effect of Strain upon Static Modulus

the same conditions, that is, our data is intended to answer the question; what is the stiffness of an isolator after its rated load has been applied?

In essence then, the static stiffness is defined as the point-slope of a load-deflection curve, with the implicit understanding that this curve was obtained from measurements made after visible flow has ceased.

It might be expected that the stiffness of a rubberlike material would not change under cyclic loading. However, it has been well established by many observers (1-11) that the modulus (stiffness) of a material is greater when the applied load is dynamic than when it is subjected to a static load of the same magnitude.

The work of these same observers and others has shown that this phenomenon is dependent upon

(1) the temperature of testing,

(2) the frequency range covered,

(3) the static strain in the specimen being tested,

(4) the amplitude of vibration, and

(5) the kind of rubberlike material of which the specimen is made.

It should be noted that when interpreting results in the literature obtained from dynamic tests, it is important to distinguish between the behavior of a material in thin strips and in bulk. For example, the velocity of a bulk compressional wave in a rubberlike material is usually taken to by greater than 3000 feet per second, while the velocity of a wave in a thin strip is usually 100 to 1000 feet per second. Further, at a given temperature, the change in modulus with

increasing frequency is not as great in a bulk specimen as it is in a thin strip. Resilient mountings are almost always constructed in such a manner as to use the rubberlike material in bulk, rather than in strips, so the discussion that follows will refer to rubber in bulk only.

In general, the various mathematical methods of specifying the viscoelastic properties of rubberlike materials (2) indicate that as the temperature increases, the dynamic modulus should be less dependent upon frequency. This qualitative statement has been verified by the work of F. P. Baldwin (1) and others (12-14), although there is considerable variation in the degree of temperature dependence of the modulus with the type of rubberlike material being tested. Usually, for any given frequency value, synthetic rubbers display a greater variation of dynamic modulus with temperature than does natural rubber. Similarly, for any given temperature, the modulus of natural rubber is less dependent upon frequency than that of synthetics, as is shown in Figure III-8. Other observers who have obtained data over much greater frequency and temperature ranges have shown important differences between different rubberlike materials with respect to the frequency dependence of modulus at a given temperature level. In general, the dynamic modulus increases with increasing frequency.

It was mentioned in Section II, "Test Equipment and Procedure", that the variation in the temperature of testing was small. Thus, any change in modulus due to a change in temperature was assumed to be of negligible importance, and the influence of strain in the specimen and of frequency will be studied.

The influence of strain upon dynamic modulus is shown in Figure

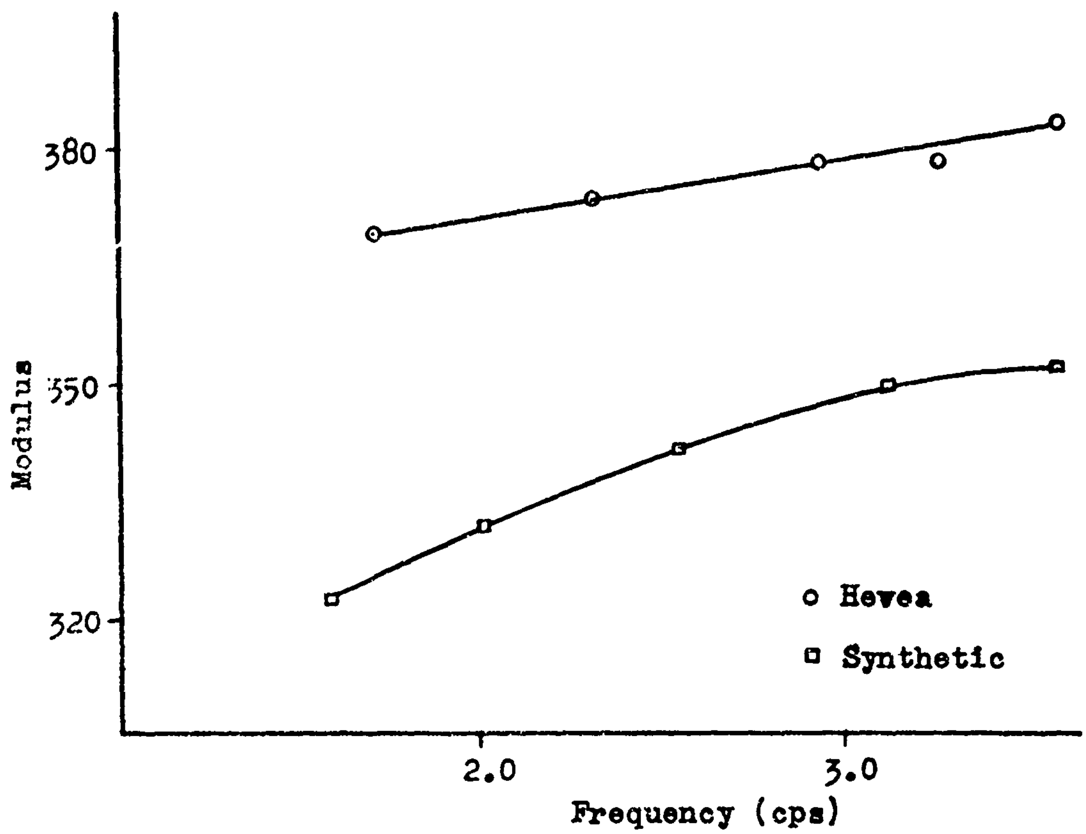


Figure III-8
Effect of Frequency on the Moduli
of Hevea and Synthetic Rubber

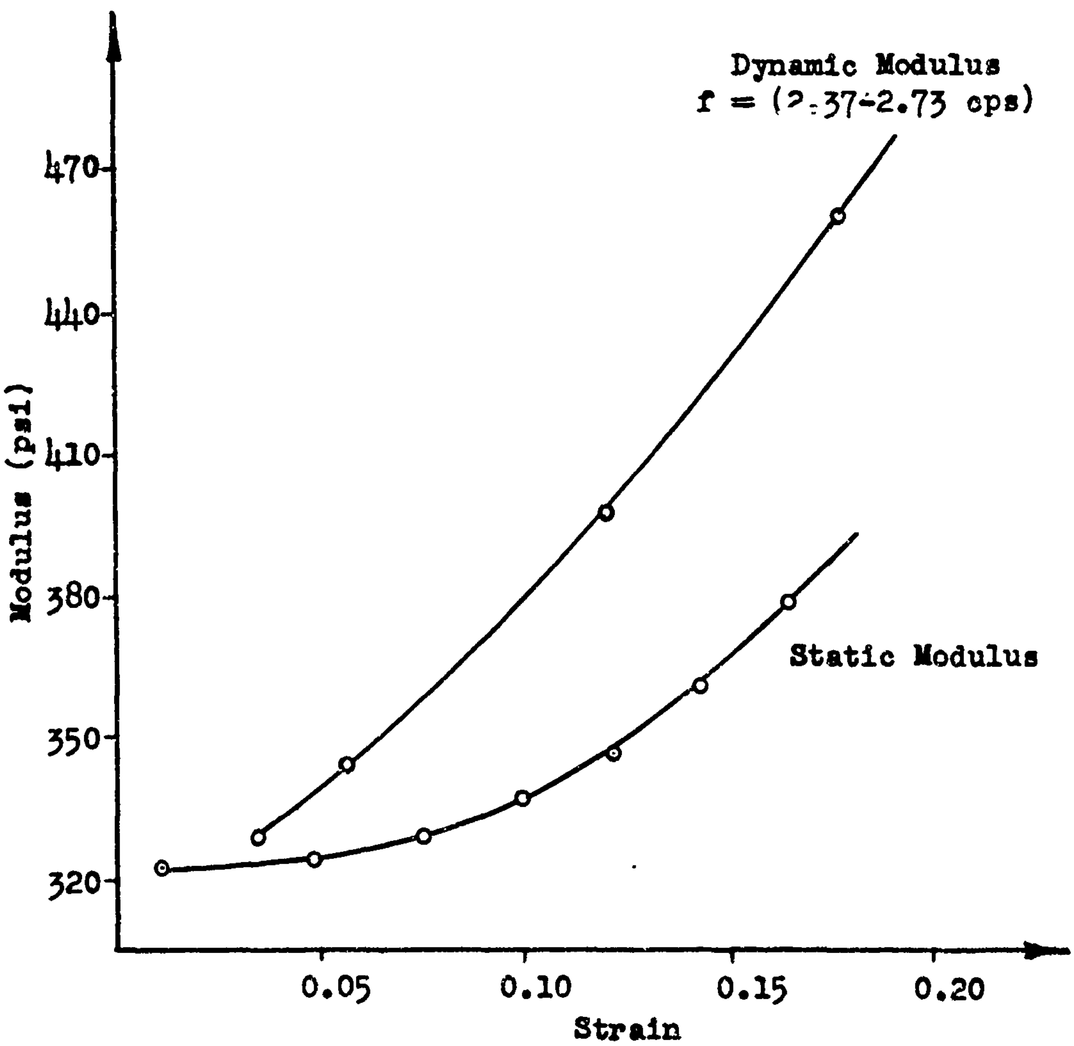


Figure III-9
Effect of Strain on Dynamic Modulus

III-9. Just as the static modulus was greater at increasing values of strain, the dynamic modulus increases with increasing strain in the specimen. In addition, for any given value of strain, the dynamic modulus will always be greater than the corresponding static modulus (1).

The example cited in Figure III-9 is at a very low value of frequency, but other work indicates the same qualitative statement is valid at higher frequencies.

Dynamic modulus is a function of the amplitude of vibration as well, an effect which may be connected with the increase in temperature of the test piece due to vibration (7, 18). The existence of this functional relationship can be shown directly by securing resonance curves using different driving forces so as to obtain different amplitudes at resonance. Two such curves (18) are shown in Figure III-10. The test pieces in this case were two parallel rubber cylinders of 30-durometer hardness adhered at the ends to metal, height 1-3/8 inch, diameter 2 inches. As can be seen in the figure, the effect of increasing the amplitude is to shift the resonant frequency to a lower value, that is, with increasing amplitude, the modulus decreases. For a given rubber compound, the amplitude at resonance for the same driving force is approximately constant, that is, it is independent of the mass loading.

The reason for the dependence of the modulus on amplitude is somewhat obscure. Gehman (18) found that the temperature changes, which might be attributed to the higher hysteresis losses caused by large amplitudes, were in the proper direction. However, the rise in temperature in the test specimen was too small to account for the

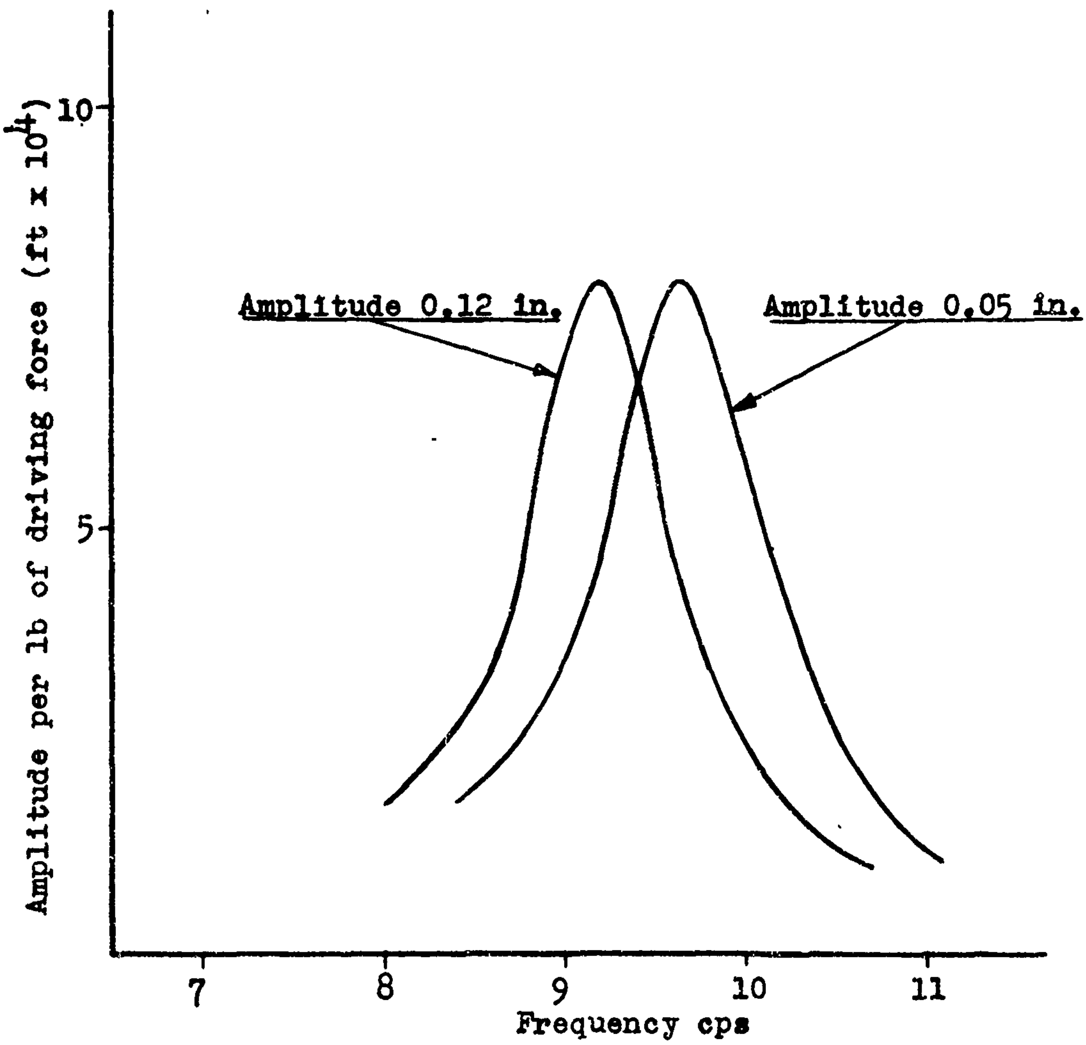


Figure III-10
Effect of Resonant Amplitude upon Resonant Frequency

entire effect. A further explanation might be: let a specimen be stressed initially, and then caused to vibrate in this condition. For increasing amplitude of vibration, there would be a decrease in the "actual" dynamic modulus computed from the hysteresis loop, that is, at the original static strain, the slope of the principal axis of the hysteresis loop would be less than that of the original stress strain curve at that point. Thus, the modulus would be less and a lower resonant frequency should be expected. The actual explanation of the phenomenon may be a combination of these two effects.

In nature, there is resistance or friction offered to all motions; in all so-called elastic materials, there is a certain amount of inherent internal friction which offers a resistance to any deformation of the material. When this resistance is a function of the first power of the velocity of the motion, it is defined as being viscous. Close approximations to this ideal are the low-velocity motion of a body through air and the internal friction in a block of rubber.

In Engineering Report No. 1, dated 14 June 1949, page 10, there is a family of curves which show the effect of varied amounts of damping upon transmissibility. As the amount of damping increases, the maximum value of the transmissibility decreases. In addition, the frequency ratio at which this peak value occurs becomes smaller as the damping increases. Thus, the viscous resistance present in a specimen of rubber has an important effect upon the dynamic characteristics of the specimen.

In a forced vibration apparatus, data can be taken to form a hysteresis loop (see Figure III-11). This can be accomplished by

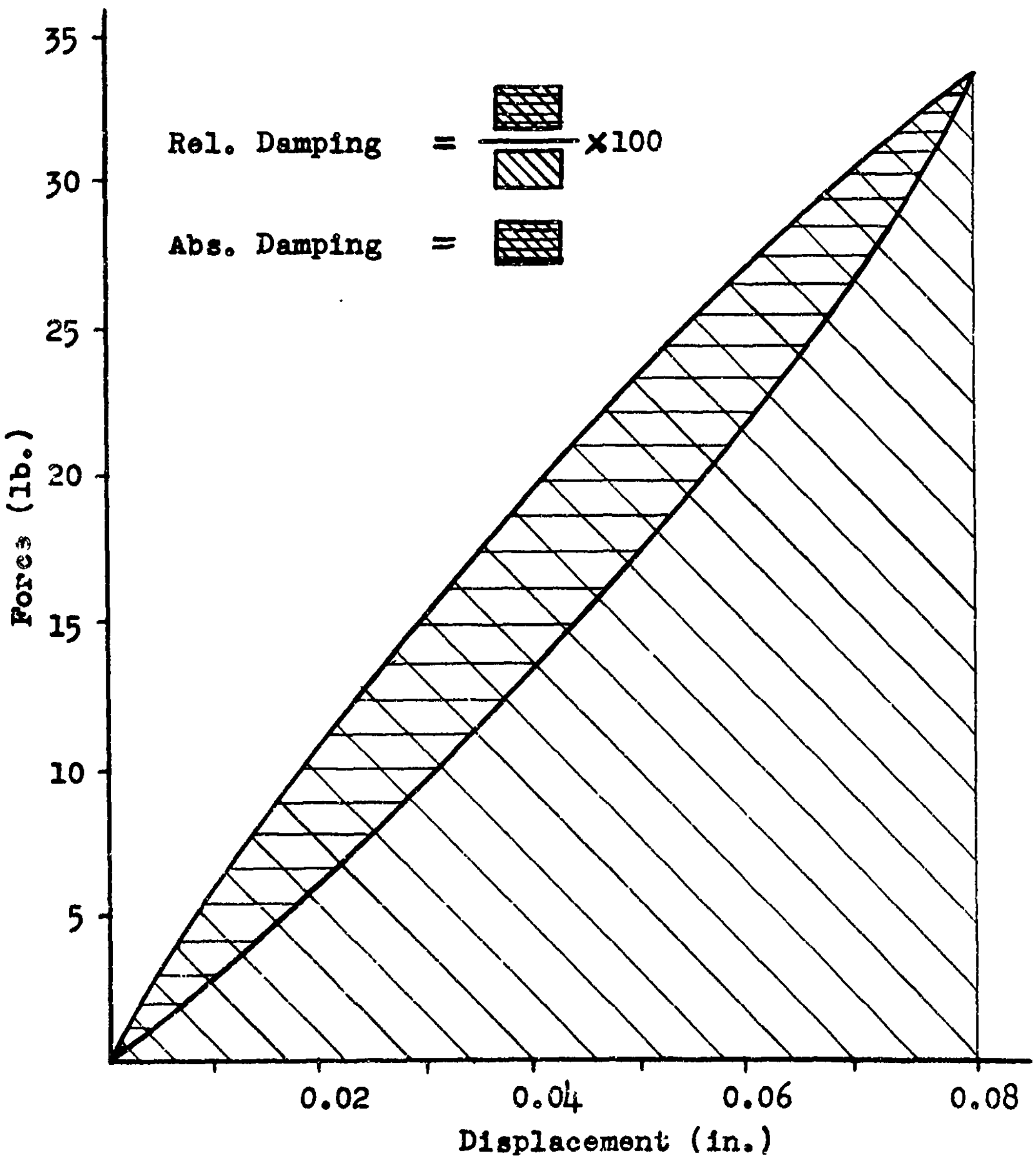


Figure III-11
Relative and Absolute Damping

means of either a cathode-ray oscillograph or a light beam. From this loop the modulus can be evaluated in terms of the principal axis of the loop. The area of the loop, when normalized in suitable coordinates, is referred to as the "absolute damping" (1). This is a measure of the energy expended in overcoming the viscous resistance of the specimen during one complete vibration. All of this energy is dissipated as heat in the specimen.

When the ratio of the area of the hysteresis loop to the area under the compression curve is expressed in per cent it is known as the "relative damping" (see Figure III-11). In a steel spring, for example, the relative damping is of the order of one-half of one per cent.

The magnitude of the damping resistance is discussed in terms of two quantities: a damping constant c, and a coefficient of internal viscosity η. The relationships that exist between these two quantities and how they can be determined by experiment will be explained below.

Consider the motion of a cylindrical test specimen of a rubber-like material vibrated in compression by a sinusoidal force $F_0 \sin\omega t$. The differential equation which characterizes this motion is*

$$m\ddot{x} + c\dot{x} + kx = F_0 \sin\omega t \tag{24}$$

where m is the mass of the load on the specimen, c is the damping constant (lb-sec/in), k is the stiffness of the specimen (lb/in), and $F_0 \sin\omega t$ is the forcing function (lb). The displacement x in

*This is based on the assumption of viscous damping. For a development of this equation, see (16), p 63, equation (12).

equation (24) is given by

$$x = x_0 \sin \omega t \tag{25}$$

where x_0 is the amplitude of the motion (in.).

For a rubberlike material, the equivalent damping constant c is assumed to be related to the coefficient of internal viscosity η by (1,19)

$$c = \eta \frac{A}{h} \tag{26}$$

where η is in lb.-sec/sq. in., and (A/h) is a shape factor of the cylindrical test specimen with the dimension of inches, A being the cross-sectional area (sq. in.) and h the unstrained height of the specimen (inches).

It can be shown (1) that the absolute damping is equal to the work done in one complete cycle to overcome the viscous resistance of a material, that is

$$W_\eta = 2\pi^2 \frac{A}{h} x_o^2 \eta f \tag{27}$$

where W_η is the work done (inch-pounds) and f is the frequency of the motion (cps).

The total work done W_t in overcoming both the viscous and elastic forces in the rubber during a compression cycle is given by

$$W_t = \frac{1}{2} W_\eta + W_k$$

$$= \pi^2 (\frac{A}{h}) x_o^2 \eta f + 2(\frac{A}{h}) x_o^2 k \tag{28}$$

where k is the elastic modulus (psi) and the other terms have the same significance as before.

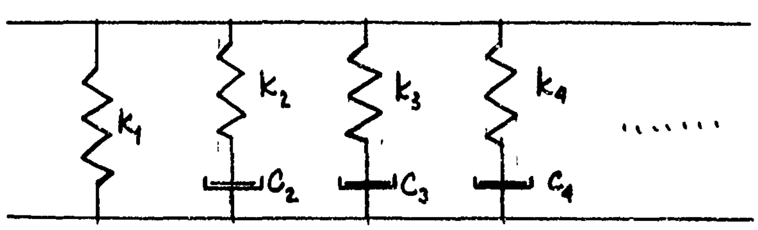
The relative damping is defined as

$$\frac{W_\eta}{W_t} \times 100 = \frac{200}{1 - (2/\pi^2)(k/\eta f)} \tag{29}$$

The areas which represent W_t and W_η <u>on a plot of force vs. displacement</u> are shown in Figure III-11.

Once η and k have been determined, at a given frequency, the absolute and relative damping can be computed readily by equations (27) and (29). By equation (26) it is always possible to compute the damping constant c.

The assumption that the damping in a rubberlike material is of a viscous nature is a common practice among engineers (1, 4-11, 15, 17-19). Thus, in light of this assumption, the motion of a single degree of freedom, oscillatory system can be characterized by equation (24), where the damping constant c can be computed by equation (26). The effect of the non-viscous character of the damping in a rubberlike material upon the dynamic characteristics will be investigated in the coming year to ascertain the validity of the assumption and, consequently, equation (24). Perhaps, if it was assumed that a resilient mounting should be represented by a series of Maxwell units, that is,



where the k_i and the c_i can be determined, then more accurate predictions could be made as to the dynamic characteristics of mountings.

Section III

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SECTION IV

DISCUSSION OF TEST RESULTS

Section IV

Discussion of the Test Results

The test results have been compiled in three forms in this report:

a) a resumé of the test results is given in tabular form as supplementary information to the isolator list in Section VI, Appendix B;

b) in Section VI, Appendix D, there is a series of curves which are the graphical representation of

c) the original test data (Section VI, Appendix E).

In each case, the appendices are preceded by appropriate explanatory remarks as to their content.

Since tabulated data is rather difficult to interpret and discuss, in general this discussion will refer to the curves given in Appendix D. However, if exact values of the data are desired, it is suggested that reference be made to the appropriate tabulation in Appendix E.

Before discussing the characteristics of the individual resilient mountings tested on this contract, some effort should be made to familiarize the reader with the general types of mountings and materials available commercially.

In general, resilient mountings can be grouped in four classes according to type of elastic medium used in their construction, namely,

(1) metal springs,

(2) a rubberlike material,

(3) other resilient materials (such as cork and felt), and

(4) combinations of the three mediums given above.

The first class, metal springs, are by far the most common, since

the field of their use is as broad as that of machine design itself. They are used to isolate the most delicate scientific instruments, and yet masses weighing up to 450 tons have been isolated satisfactorily with them. In theory, at least, the complete spectrum of frequencies can be isolated by metal springs. This is due to the large variations of deflections and stiffnesses obtainable by changing the dimensions and materials of the springs.

Inherently, metal springs have very little damping; helical springs having considerably less than leaf springs, where it is present as dry friction loss between the leaves and as a hysteresis loss in the flexed member. However, in either case it is commonly considered to be negligible (approximately, one-half of one per cent in steel helical springs).

In addition to these elastic properties, metal springs have the following beneficial chemical characteristics: they resist corrosion by oil and water and are not affected by extremes in operating temperature. This permits their use in many installations where other materials fail. An advantage of industrial importance is that they can be mass-produced readily without great variations in their individual properties.

However, as Geiger and others have pointed out, metal springs have the practical disadvantage that they transmit audio frequencies without appreciable loss. The mechanism by which this is accomplished has not yet been established, but the existence of the phenomenon is well known. The spring-type isolators tested on this contract exhibited the same effect (see curves 038B-c and 093B-c, Appendix D).

This means that although the low (15 cps) natural frequency of an

engine can be isolated quite easily, the higher (audio) frequencies present are transmitted along the helix of the spring to the foundation. These frequencies of 200 cps and higher can be traced to detonation in the cylinders, local resonances at the mounts, and other similar sources. Manufacturers recognize the existence of these vibrations in the engine and have attempted to prevent their transmission to the foundation. Usually, this is done by insuring that there be no direct contact between the spring and the supporting structure: for example, by means of rubber pads between the spring ends and the foundation.

Apparently not much has been done to study the propagation and isolation of this type of vibration; although, in 1900, Love published a solution to the problem of the propagation of waves of elastic displacement along an infinitely-long wire in the shape of a helix (23)*. There are other references to similar work in the bibliography (24-27).

For an extensive treatment of metal springs, which is beyond the scope of this report, see reference (28). In addition, there is a very extensive literature on the subject of mechanical springs.

Rubberlike materials (natural rubber, neoprene, etc.) have been used very effectively to isolate small machinery units. In most installations it is used in bulk, rather than in strips and in both compression and shear, or a combination of them. In compression it carries considerably heavier loads than in shear, but the deflections are very much smaller; hence, it is generally used in shear to obtain low values of stiffness with greater permissible deflections. In shear,

*Numbers in parentheses refer to references in the bibliography at the end of Section III.

for moderate loading (between 40 and 70 psi), the load-deflection curves of specimens of these materials are approximately linear. In contrast, in compression the stiffness increases greatly with increased deflections.

The use of rubber in compression has the advantage of long experience, higher energy storing capacity and ease of application and manufacture. The disadvantages are the shape factor, the complicated stress distribution, the empirical nature of design constants and nonlinearity of the stress-strain curve.

The use of rubber in shear is regarded as the best way of employing to the full its unique characteristics, particularly its flexibility. The stress-strain curve in shear is substantially linear up to the maximum stresses usually employed. The main difficulties lie in lack of experience and data on the appropriate constants and the absolute necessity for bonding the rubber to the metal. The technique involved in manufacture tends to be more advanced and includes injection molding if a number of metal inserts are involved.

In some designs, where both shear and compression properties are used, the shear deflection of the rubber carries the vibratory stresses while the gravity loads and inertia forces are taken in compression. A typical mounting may be fifty times as stiff in compression as it is in shear.

Unlike metal springs, rubber isolators are affected materially by oil and gasoline, high temperatures (above 125 to 150°F.), and heavy loading. However, as the more advanced techniques in rubber technology are being developed and perfected, materials are becoming available which minimize these disadvantages.

One of the oldest materials used for vibration isolation is cork. It is used in compression or in a combination of compression and shear. Unlike a rubberlike material in compression, cork becomes less stiff at high loadings, displaying the same type of stress-strain curve as copper. Also, its properties are very much dependent upon frequency.

Generally, in order to obtain sufficiently large deflections, the machine to be isolated is mounted on large concrete blocks which are separated from the surrounding foundation by a layer of cork slabs from one to six inches thick. The recommended pressure to which the cork should be subjected for optimum performance are between 1000 and 3000 psi.

Oil, water, and moderate temperatures have little effect upon the operating characteristics of cork, but it does tend to compress with age. It is not a very effective isolator in the low frequency range, since great thicknesses are needed to achieve the correspondingly large deflections required. Unless the slabs were of great cross-sectional area, this could lead to a very unstable condition.

When felt is used as a biration isolating material, the greatest isolating efficiency can be obtained by using the smallest possible area of the softest felt, in maximum thickness, under a load which the felt will resist without excessive compression or loss of structural stability (29). It has a high damping factor and thus is particularly useful in the resonant speed ranges to reduce resonant amplitudes. For general purposes felt mountings of 1/2- to 1-inch thicknesses are recommended with an area of approximately five per cent of the area of the base, if the machine has a flat bed. When the unit is supported by legs, the area of the base of the legs is used as a criterion of how much felt is needed. In installations where vibration is not excessive

and the machine weight is sufficient to insure a permanent position on the foundation, no bonding between the felt and the machine is necessary. If such is not the case, the felt must be bonded to the machine and the foundation, either by a cement or one of the recommended mechanical means (29).

Resonant curves of loaded felt pads in compressional vibration give values of the damping and dynamic stiffness which show that felt in vibration is quite different from an equivalent perfect spring with viscous damping. The unsymmetrical resonance curves and the fact that, within experimental error, the stiffness is inversely proportional to the square root of the thickness indicate a decrease in stiffness with increasing amplitude. The increase of stiffness with pressure is so large that the ratio of elastic modulus to pressure (stiffness to mass) does not vary greatly between pressures of from 3 to 100 psi. In this range the frequency of a mass on a felt pad is determined by the thickness of the pad rather than its area and static load. In most cases, the effectiveness of felt in reducing vibration transmission is limited to frequencies above 40 cps (30).

There are some commercial isolators available that combine two or more of these elastic media into one isolator, for example, a Barry Corporation type uses a conical steel spring and a rubber pad in series, and Korfund type ER/D-4 uses rubber and cork in compression. In fact, nothing but the ingenuity of the designer limits the possible combinations of elastic media. Thus, there are many different isolators available. Not all of these have been tested on this contract, but test data for the representative types from seven manufacturers are given herein. More mountings have been obtained recently--and others will

be secured in the future--to make this survey of the field as complete as possible.

It is difficult to make any general statements concerning the stress distribution in the resilient elements of the isolators because their unusual forms introduce an almost unpredictable shap factor. However, there are indications, which are discussed in more detail later in the section, that the shape of a particular mounting has a very definite effect upon its dynamic transmission characteristics, particularly at high frequencies (250 cps and greater).

Cross section drawings of the various types of resilient mountings are given in Appendix A. They indicate that most of the isolators tested were disigned so that the flexed member is stressed primarily in shear. This was borne out by the almost linear load-deflection curves of these same mountings, which is typical of a moderately loaded rubber specimen in shear. Other mountings, such as, Lord type 281 PH 120 (151), and Hamilton Kent type H-40 (066H) exhibit the familiar S-shaped load deflection curve characteristic of a rubberlike material subjected to a compressive test.

In general, the mountings which use a rubberlike material are roughly cylindrical in shape with a single point of fastening at the top. This is true whether they were designed for shear or compression. Some exceptions to this rule are Korfund type ER/D-4 (175K) and Hamilton Kent type H-40 (066H). The Korfund mounting has a resilient element which consists of rectangular layers of rubber and cork bonded together, both being under a compressive stress when the isolator is loaded. At high loadings, the effect of this is to increase the stiffness. The Hamilton Kent vibration mount uses just rubber as the elastic medium. However it is formed in the shape of the letter X with the axis of

loading passing vertically through the center of the letter in the plane of the paper. At normal loading, the element takes the load primarily in shear. If the loading is increased and becomes excessive, the sections which form the top and bottom of the X come in contact with the metal container and essentially form a compressive pad to take the load. This tends to increase the stiffness of the mount appreciably at high loading.

With these exceptions, the static load-deflection curves of the mountings were very close to linear through their rated load range. The static stiffnesses of the individual mountings were computed from these curves by means of the equations mentioned in Section III, "Applicable Theory."

It should be noted here that these curves represent data obtained in the manner described in Section II, that is, after each change in the load, the deflection reading was made only after visible flow in the resilient element had ceased.

The dynamic stiffness of each isolator was computed from data obtained at resonance using equation (a), Appendix F. For the rubber mountings these values of dynamic stiffness were from 1.5 to 2.5 times greater than the corresponding static stiffnesses.

If the resonant frequency was in excess of 12 cps, the accelerometers were used to obtain the test data and there is little question as to their validity. However, if the frequency of maximum forced amplitude was in the range from 4 to 11 cps, then there may be some question as to the magnitude of the peak value of the transmissibility. In this frequency range, which is at the upper limit of usefulness of the dial gages and below the lower limit of sensitivity of the accelerometers,

it was very difficult to obtain unquestionable data. It was extremely difficult to read accurately the relative displacements or the accelerations of the weights, even though the frequency of maximum forced amplitude could be located in the spectrum within approximately 0.2 cps. In the range where dial gages were used this was due to the inability of an operator to read the motion of the needles accurately and due to inertia effects in the mechanism of the gages themselves. As to the accelerometers, their response falls off rapidly below 10 cps, which raises the question as to the proper value of the calibration constant to use.

In addition, the voltmeter needle is not damped and, thus, responds very quickly to changes in the signal voltage from the accelerometers. At low frequencies, in the range up to 10 cps, this means that the voltmeter needle is not steady enough to read accurately.

Wherever possible in this frequency range, data were taken by both means as a check on their reliability. Above 12 cps accelerations were measured with the accelerometers only and no dial gage readings were used.

Consider the plot of decibel change vs. frequency ratio which is shown in Figures IV-1 and IV-2. The decibel change n was computed from the relationship

$$n = 20 \log \epsilon$$

where

$$\epsilon = \sqrt{\frac{1 + 4\rho^2 r^2}{(1 - r^2)^2 + 4\rho^2 r^2}}$$

The effect of damping is shown for values of $\rho = 0.025$, 0.05, 0.10 and 0.20. It can be shown that at high frequencies (r very large)

$$\epsilon \approx \frac{2\rho}{r}$$

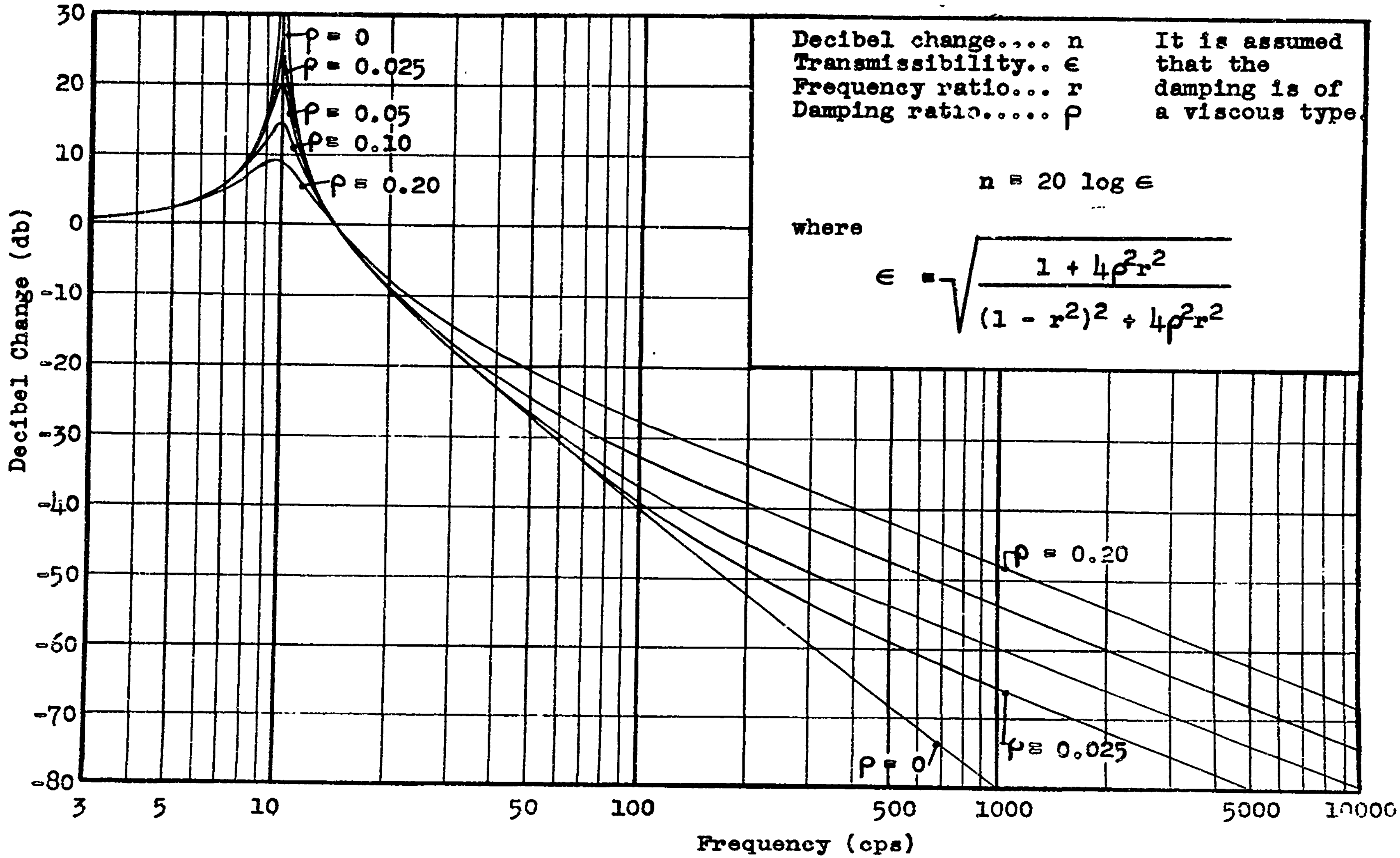


Figure IV-1 : Effect of Damping upon the Decibel Change across an Isolator

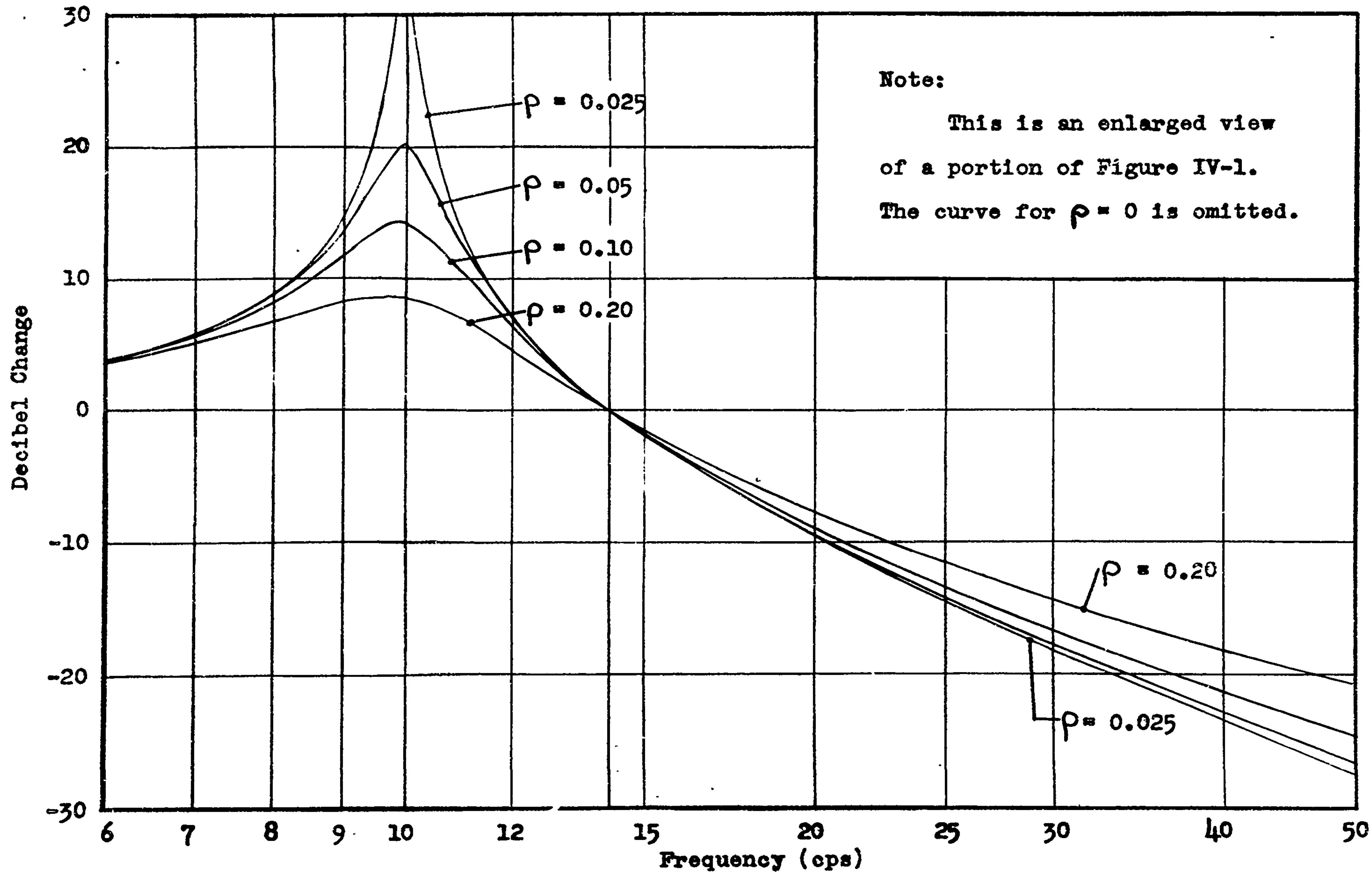


Figure IV-2 : Effect of Damping upon the Decibel Change across an Isolator

Thus, in this frequency range, doubling the damping, decreases the decibel change by six db. By comparing the curves, this can be verified very readily. At high frequencies the curves are almost parallel.

The decibel change vs. frequency curves of the mountings were compared with the curves of Figure IV-1. Within the limits of experimental error, there was an excellent comparison up to the intermediate frequency range between the empirical curves and the computed curves (for which viscous damping was assumed).

Above about 250 to 600 cps, which corresponds to values of frequency ratio between 18 and 40, the empirical curves departed radically from what the theory based on the assumption of viscous damping predicts. The decibel drop across the isolator did not continue to increase at higher values of frequency as in the curves of Figure IV-1.

As can be seen from the decibel change vs. frequency curves, this change in the action of the mountings did not manifest itself as a gradual change in the slope of the curves, but rather as a series of abrupt changes or peaks. It might be thought that all of the points beyond about 300 cps represent resonances, but it can be shown very readily with the oscilloscope that only certain of the decibel loss values obtained are accompanied by the phase shift which indicates a true resonance. From the action of the Lissajou figures associated with the other points it was possible to determine the general nature of the slope there. The curves in Appendix D were plotted in this manner. It should be noted that the peaks are not all of the same magnitude and usually become greater in magnitude as the exciting frequency increases.

In order to be sure that this change was definitely a characteristic of the isolator and not caused by extraneous resonances in the system, a series of tests were conducted to determine the effect, if

any, of all of the component parts of the system upon the data. The component parts of the system considered consisted of the following:

(1) the weights (specifically, their size and shape),

(2) the guy wires,

(3) the accelerometers and/or the electronic system,

(4) the suspension system, and

(5) the driver or exciter.

These component parts will be considered in the order indicated above. If the exciting frequency was very nearly equal to the fundamental longitudinal frequency of the weight (or some harmonic of it), it could cause a standing wave in the weight that would be of sufficient magnitude to be recorded by the upper accelerometer. Thus, the voltage induced would not only be a measure of the force transmitted through the isolator, but would include the energy of this reflected wave as well. If this were true, it would follow that the peaks would be very sensitive to the shape of the weight, principally, to its longitudinal dimension.

Six tests were conducted; three radically different weights were used to load two different isolators. The isolators had mid-range normal loadings of approximately 60 pounds, but they were not of the same shape (one was an MB isolator, the other was a Barry mounting). The weights, although of approximately the same weight, were decidedly different in shape, as can be seen from the following table:

Weight # 1 ....a parallelopiped (8" x 8" x 4"), weighing 75.5 pounds, with the 4" dimension along the axis of excitation;

Weight # 2.....a right circular cylinder (4" dia. x 19"), weighing 65.5 pounds, with the axis of symmetry as the axis of excitation;

Weight # 3.....a right circular cylinder ($6\frac{1}{2}$" dia. x $7\frac{1}{4}$"), weighing 64.0 pounds, with the axis of symmetry as the axis of excitation.

The results of these tests indicated that the shape of the weight had no effect upon the test data. However, the slight differences in actual weight of the three masses did cause a small shift in the value of the resonant frequency of the isolator, as should be expected.

A test was conducted in which the guy wires were isolated from the weight and there was no change in the data obtained.

The accelerometers were recalibrated and it was found that the new calibration points lay on, or nearly on the original calibration curve obtained in December, 1949 (see Figures II-2, -3, -4, -5). The components of the electronic system were checked and found to be functioning properly.

In order to determine whether or not the suspension system had any effect upon the data, two tests were conducted with two very small isolators rated at less than ten pounds normal loading. Since the total weight of all the necessary components was less than seven pounds, there was no need for suspension system and they were mounted with their loads and the accelerometers directly upon the driving heads. Both tests showed the same phenomenon of peaks in the decibel change vs. frequency curves beyond certain frequency values.

An isolator was tested with the small driver (MB Manufacturing Co., Model SA (5 pound))and then retested with the MB, Model CI

(25 pound) driver, other factors in the system being left unchanged. The results obtained from both tests were the same, within the limits of experimental error.

The factors which were discussed in the preceding paragraphs have a negative significance only, in that they do not cause the inconsistencies in the action of the mountings. On the positive side there is some qualitative experimental evidence which can be offered in explanation.

If the damping in the rubberlike materials were truly of a viscous nature, then the empirical curves for any given value of the damping ratio ρ should follow the corresponding curve in Figure IV-1 very closely. Since the damping in rubberlike materials is frequency dependent, this is not true. In the frequency range through resonance and up to about 10 or 15 times the natural frequency, there is close agreement between the empirical and ideal curves. For most engineering design purposes this is sufficient and it can be assumed that the damping ratio ρ is essentially constant and equal to a value computed at resonance. However, at high frequencies the empirical curve follows the curves for lower values of ρ. At this point the viscous theory does not explain the action of the mountings satisfactorily and it may be necessary to resort to another, such as the hereditary theory, which was first advanced by Boltzmann in 1876. This theory attributes the loss of work due to internal damping to the elastic delay (elastiche nachwirkung), by which the deformation follows the applied force (31, 32).

The decibel change versus frequency curves were grouped according to the shape of the particular mountings they represented, that is, all

MB mountings of type 17, Lord mountings of type 153, and so forth, were gathered together in separate files.

By comparing these curves with one another within each separate group, and with Figure IV-1, there were indications that the frequency value of the first abrupt change in the curves was independent of the static stiffness and the frequency ratio. Unfortunately, at this time, there are not a sufficient number in each group to formulate a general statement as to the causes of this phenomenon. More exhaustive tests will be made in the near future upon mountings each of the same shape. The data from these tests should be sufficient to delve more deeply into the causes of the peaks.

The effects are obvious. A mounting may transmit certain frequencies to the foundation rather than isolating them. In themselves these vibrations may not be of sufficient energy to be transmitted any great distance in the surrounding structure, but they could cause a more severe vibration in some plate, tube, etc. whose natural frequency was the same value.

From the data it appears that metal springs exhibit this phenommenon to a more marked degree than do rubber mountings. In either case it is a resonance phenomenon which appears to cause it.

Method of Selecting Resilient Mountings

In order to illustrate a method of selecting a resilient mounting from information in this report, a typical vibration isolation problem will be given as an example.

The problem is to mount an 80-lb electric motor on four resilient mountings so as to isolate its 60-cps fundamental frequency. It is desired that the natural frequency of the selected mounting be less than 15 cps and that the transmissibility at 60 cps be less than 0.10. It is assumed that the disturbing force is sinusoidal.

This problem can be solved very easily in the following manner:

Step (1): On the Isolator Load Range Chart in Appendix C select the particular resilient mountings whose mid range load is (1/4) 80 = 20 pounds. These are mountings numbers 032M, 034L, 035L, and 042L.*

Step (2): From the relationship

$$n = 20 \cdot \log \epsilon$$

where n is the decibel change across the mounting and ϵ is the transmissibility, determine the decibel loss which is equivalent to a transmissibility of 0.10, that is,

$$n = 20 \cdot \log 0.10$$

$$= 20 \cdot \log 10^{-1}$$

$$n = -20 \text{ db}$$

Thus, at 60 cps, the decibel loss through the required mounting must be at least 20 db.

Step (3): In Appendix D, consult the decibel change vs. frequency

*See Appendix A, "Isolator List", for an explanation of these test numbers.

curves of the mountings selected in Step (1). According to the information on the curves, these four isolators were tested with a static load of 20.36 pounds, which is ideal for the purposes of this problem. All of the isolators have a natural frequency of less than 15 cps and at 60 cps their respective decibel losses were

Mounting	Natural Frequency	Decibel Loss
032M	14 cps	23 db
033L	9	32
035L	10.5	29
042L	13	25

From this information, it would appear that all four of the mountings satisfy the conditions of the problem, but that number 033L would be the best choice.

Step (4): Check the information concerning the physical makeup of the mounting in Appendix A, or, if further information is desired, consult the appropriate manufacturer's literature. If the weight to be isolated cannot be matched with the static load of testing, the natural frequency of the isolator can be computed from the load-deflection curve. Appropriate changes should be made also in the decibel loss requirement.

SECTION V

CONCLUSIONS

Section V

Conclusions

(1) Above approximately 200 cps all of the resilient mountings tested exhibited the following phenomenon: The decibel losses through the mounting, whether it was a metal spring or rubber type, did not increase according to the predictions of the viscous theory. As the frequency of excitation became greater, the peaks generally increased in magnitude. In some cases, particularly in the metal spring types tested, there was an actual gain across the mounting at certain frequencies above 5000 cps.

The transmission of these high frequencies through a mounting could cause a much larger sympathetic vibration in another part of the supporting structure.

In a rubber mounting, the frequency values of these peaks appear to be dependent upon the shape of the resilient element. In a metal spring, there was not sufficient information to formulate any such dependence.

This phenomenon should be studied further in controlled specimens under conditions which will be invariant from test to test.

(2) The test procedure developed during the period covered by this report can be adapted so as to provide a criterion of evaluation of the dynamic characteristics of resilient mountings. This procedure has been limited to the impressment of a pure sinusoidal forcing function upon the mountings along their main axis of loading. The method

and analysis of the results should be extended so that mountings can be tested in field installations, or so that their characteristics can be evaluated when the impressed loading function is a combination of several frequencies, such as would simulate the loading encountered in a field installation.

(3) In the frequency range up to approximately 100 cps there is good agreement between the empirical test results and what is predicted for the action of resilient mountings by the viscous theory. For the purposes of engineering design in the same frequency range, the values of the damping ratio (computed at resonance) can be used satisfactorily.

Above 100 cps the damping appears to be less than the theory predicts.

SECTION VI

APPENDIX

Appendix A

Isolator and Test Number List

with Drawings of Mountings

Appendix A

Isolators and Test Numbers

This is the revised list of isolators and test numbers and supersedes all previous lists. The first section of the compilation lists the isolators according to test number and the second, according to manufacturer. In the first section, the isolators tested on this contract have been designated with an asterisk.

All curves in the report are referred to their appropriate test numbers, such as 097M-c where the small letter suffix denotes the type of curve, that is,

Suffix:	Curve:
-a	Static Deflection
-b	Transmissibility vs. Frequency
-c	Decibel Change vs. Frequency

Load Range 0-10 lbs

*001L	Lord 150PH4
*002B	Barry 236-10
*003B	" 104-10
004L	Lord 153PH6
*005L	" 102PH6
*006L	" 150PH10
*007L	" 153PH10
*008L	" 102PH10
*009B	Barry 104-20
010H	Kent LH5-1
011L	Lord 156PH6
*012L	" 156PH9
013L	" J-4582-1
014V	Bushings Inc., 3010

Load Range 11-30 lbs

031B	Barry C2015
*032M	MB 1732.6
*033L	Lord 206PH20
*034L	" 153PH20
*035L	" 204PH20
*036M	MB 1733.2
037L	Lord H 1000-23
*038B	Barry 712-13
*039L	Lord 156PH13
040L	" 156PH20
041L	" 156PH30
*042L	" 200PH20
043L	" J-4582-2
044V	Bushing Inc., 3025
045L	Lord 206PH30
046F	Firestone DA 1090 40 Duro**
047F	" DA 1089 40 Duro

Load Range 31-50 lbs

*061M	MB 1735.6
*062L	Lord 200PH35
*063L	" 204PH35
*064B	Barry C2045
065L	Lord 200PH60
*066H	Kent H-40
067V	Bushings Inc., 3050
*068L	Lord 206PH45
069F	Firestone DA 1089, 50 Duro
070F	" DA 1089, 60 Duro
071F	" DA 1090, 60 Duro.

Load Range 51-70 lbs

*091M	MB 1738.3
*092M	" 507C12
*093B	Barry 712-25
*094L	Lord 200XPH60
*095L	" 204PH60
096L	" H1000-60
*097M	MB 17310
*098M	MB 507C10
099F	Firestone CA 368 #1, 40 Duro

**Duro signifies "durometer hardness". For an explanation of this hardness scale see (17) (21) of the bibliography, Section III.

Load Range 71-90 lbs

*111L	Lord 200XPH75
*112M	MB 507C15
113L	Lord H5019-86
*114L	" 204PH87
*115M	MB 508C18
116K	Korfund ER/S-4
117B	Barry C-2125
118F	Firestone CA 244 #5, 30-35 Duro

Load Range 91-110 lbs

131B	Barry 2090H
*132L	Lord 204PH100
*133M	MB 508C22
*134V	Bushings 3100

Load Range 111-150 lbs

*151L	Lord 281PH120
*152L	" 283PH120
*153L	" 279PH120
*154M	MB 508C26
155L	Lord H 3000-140
156B	Barry C-3125
*157H	Kent H-150
158F	Firestone CA 244 #5, 40 Duro

Load Range 151-200 lbs

*171M	MB 508C32
*172M	MB 510C32
*173M	MB 510C38
174B	Barry C-3175
*175K	Korfund ER/D-4
176K	Korfund ER/W-4
177V	Bushings Inc., 3200
178L	Lord H-5006
179F	Firestone CA 368 #2, 40 Duro.

Load Range 201-300 lbs

191B	Barry C-3225
192M	MB 512C46
193M	MB 512C56
194K	Korfund AER-4
195V	Bushings.Inc., 3300
196L	Lord H-5017
197L	Lord H-5013
198F	Firestone CA 244 #5, 50 Duro.
199F	" CA 244 #6, 60 Duro.

Load Range Greater than 301 lbs

211M	MB 512C68
212M	MB 512C83
213M	MB 512C100
214M	MB 516C100
215M	MB 516C121
216M	MB 516C147
217M	MB 516C178
*218M	Special MB
219H	Kent H-1300
220V	Bushings Inc., 3400
221V	" " 3500
222V	" " 3700
223V	" " 4000
224L	Lord H-5020
225L	" H-9004
226L	" HS-3001
227L	" HS-3002
228L	" HS-7004
229F	Firestone CA 368 #2, 60 Duro.
230F	" CA 1595, 30-35 Duro.
231F	" CA 1595, 40 Duro.
232F	" CA 1595, 50 Duro.

The Barry Corp.

Type	Load Range	Test No.
104-10	6-14	003B
104-20	10-26	009B
236-10	5-10	002B
712-13	30-125	038B
712-25	60-250	093B
C-2015	14-41	031B
C-2045	40-120	064B
C-2125	70-300	117B
C-3125	150-600	156B
C-3175	200-800	174B
C-3225	250-1000	191B

Bushings Inc.

3010	10	014V
3025	25	044V
3050	50	067V
3100	100	134V
3200	200	177V
3300	300	195V
3400	400	220V
3500	500	221V
3700	700	222V
4000	1000	223V

Firestone Industrial Products Division, Firestone Tire & Rubber Co.

DA 1090, 40 Duro	19-24	046F
DA 1089, 40 Duro	26-32	047F
DA 1089, 50 Duro	32-42	069F
DA 1089, 60 Duro	42-60	070F
DA 1090, 60 Duro	31-50	071F
CA 368 #1, 40 Duro	70-140	099F
CA 244 #5, 30-35 Duro	90-150	118F
CA 244 #5, 40 Duro	150-210	158F
CA 368 #2, 40 Duro	170-230	179F
CA 244 #5, 50 Duro	210-290	198F
CA 244 #5, 60 Duro	290-390	199F
CA 368 #2, 60 Duro	300-430	229F
CA 1595, 30-35 Duro	350-450	230F
CA 1595, 40 Duro	450-650	231F
CA 1595, 50 Duro	650-950	232F

Hamilton Kent Mfg. Co.

Type	Load Range (lb)	Test No.
LH5-1	1-10	010H
H 40	40	066H
H 150	150	157H
H 1300	1300	219H

The Korfund Co., Inc.

ER/D-4	160-560	175K
ER/W-4	160-560	176K
ER/X-4	80-560	116K
AER-4	300	194K

Lord Mfg. Co.

102PH6	6	005L
102PH10	10	008L
150PH4	4	001L
150PH10	10-15	006L
153PH6	6	004L
153PH10	10	007L
153PH20	20	034L
156PH6	6	011L
156PH9	9	012L
156PH13	13	039L
200PH20	20-40	033L
200PH35	35-70	062L
200XPH60	60-120	094L
200XPH75	75-120	111L
204PH20	20	035L
204PH35	35	063L
204PH60	60	095L
204PH87	87	114L
204PH100	100	132L
206PH20	20	042L
206PH30	30	045L
206PH45	45	068L
279PH120	120	153L
281PH120	120	151L
283PH120	120	152L
H 1001	23	037L
H 1003	60	096L
H 3004	140	155L
H 5019	86	113L
H 5006	175	178L
H 5017	225	196L
H 5013	275	197L
H 5020	325	224L

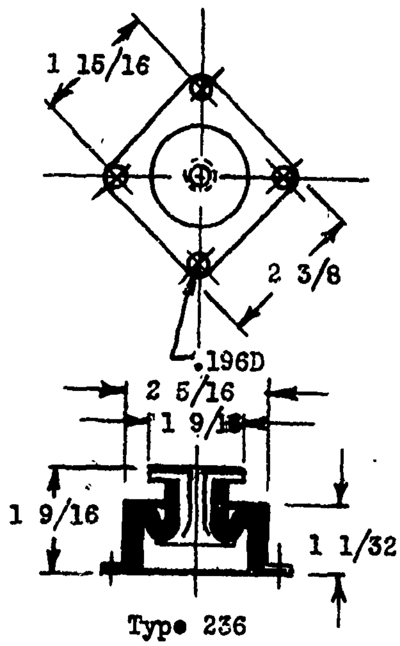
Lord Mfg. Co. (continued)

Type	Load Range (lb)	Test No.
H 9004	510	225L
HS 3001	450	226L
HS 3002	550	227L
HS 7004	1060	228L
J-4582-1	6-13	013L
J-4582-2	10-20	043L

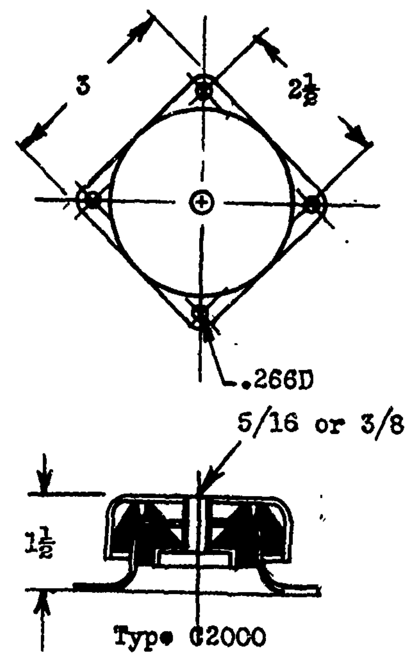
The M. B. Co.

1732.6	16-26	032M
1733.2	20-32	036M
1735.6	35-56	061M
1738.3	51.8-83	091M
17310	62.5-100	097M
507C10	50-150	098M
507C12	60-180	092M
507C15	75-225	112M
508C22	110-330	133M
508C18	90-270	115M
508C26	130-390	154M
508C32	160-480	171M
510C32	160-480	172M
510C38	190-570	173M
512C46	230-690	192M
512C56	280-840	193M
512C68	340-1020	211M
512C83	415-1245	212M
512C100	500-1500	213M
516C100	500-1500	214M
516C121	605-1815	215M
516C147	735-2205	216M
516C178	890-2670	217M

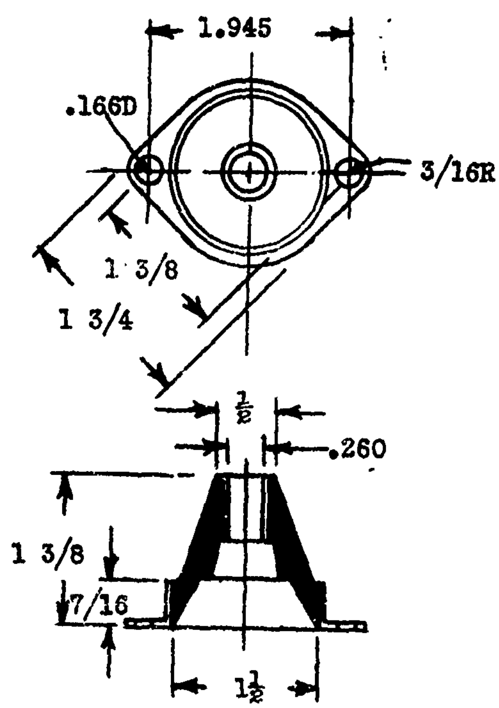
Figure VI-1
Isolators Manufactured by The Barry Corp.



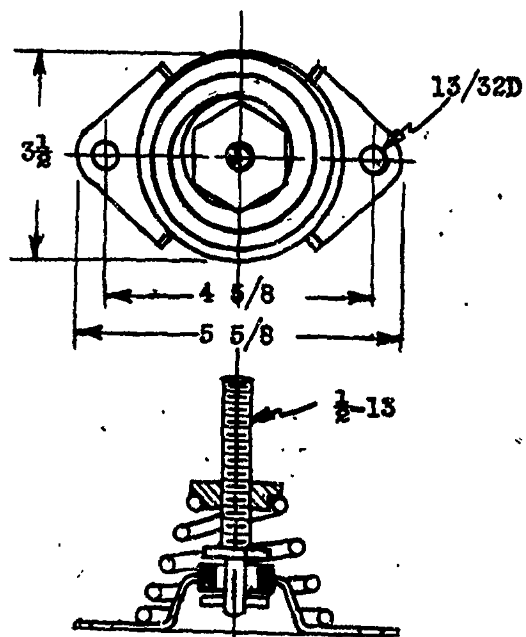
Type 236
Test No. 002B



Type C2000
Test No. 064B



Type 104
Test Nos. 003B & 009B



Type 712
Test Nos. 038B & 093B

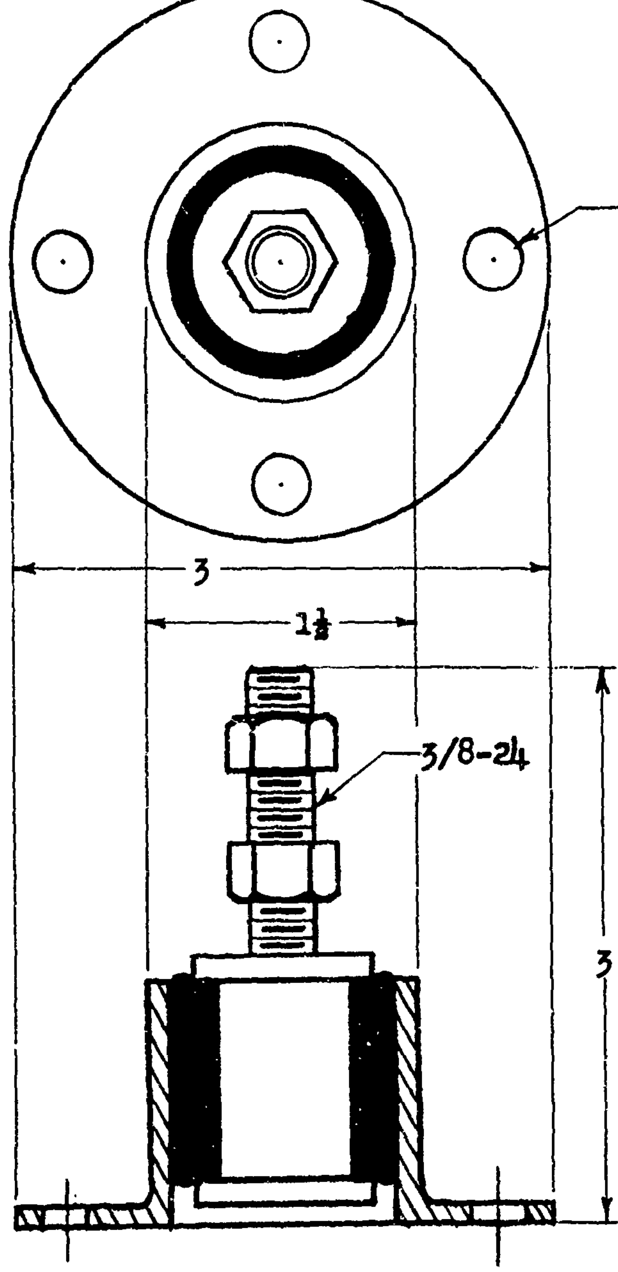
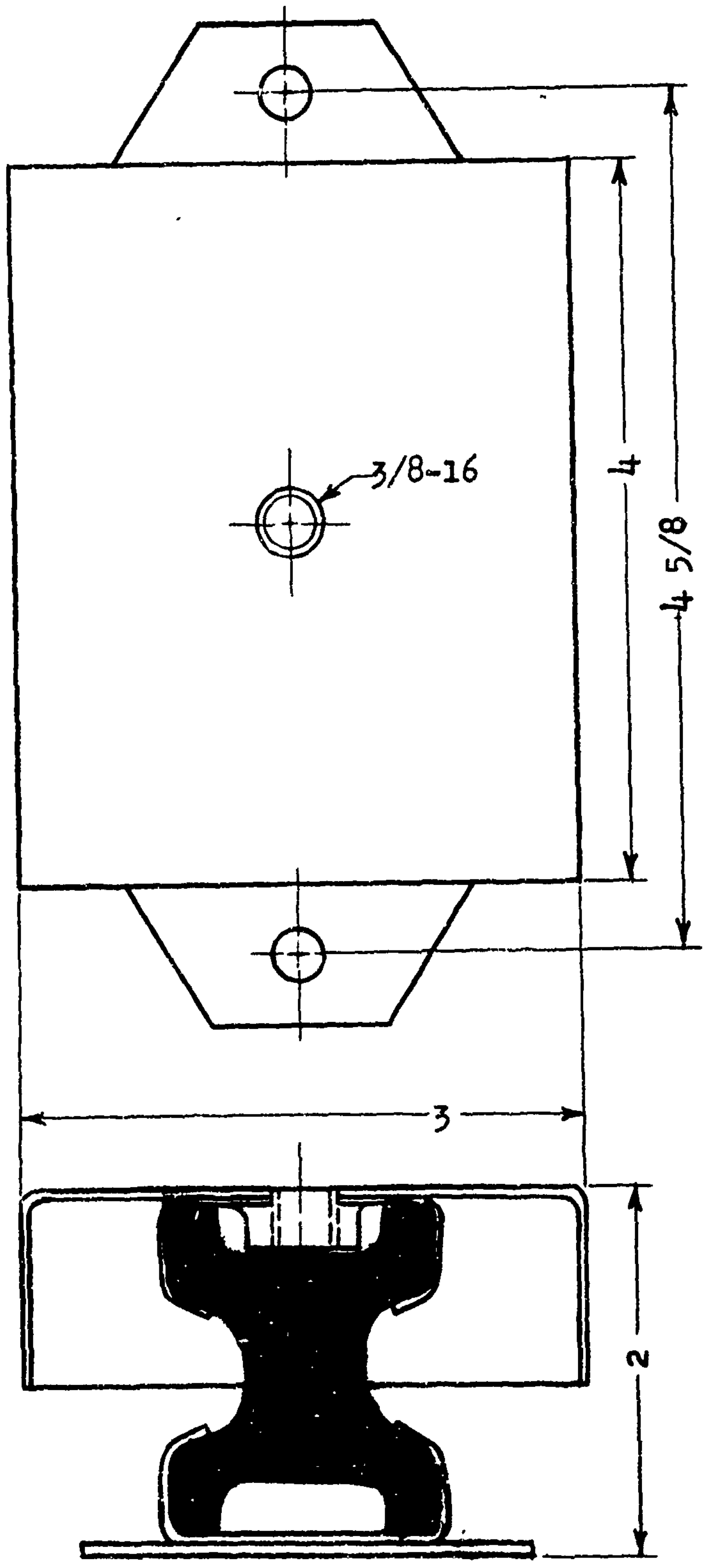


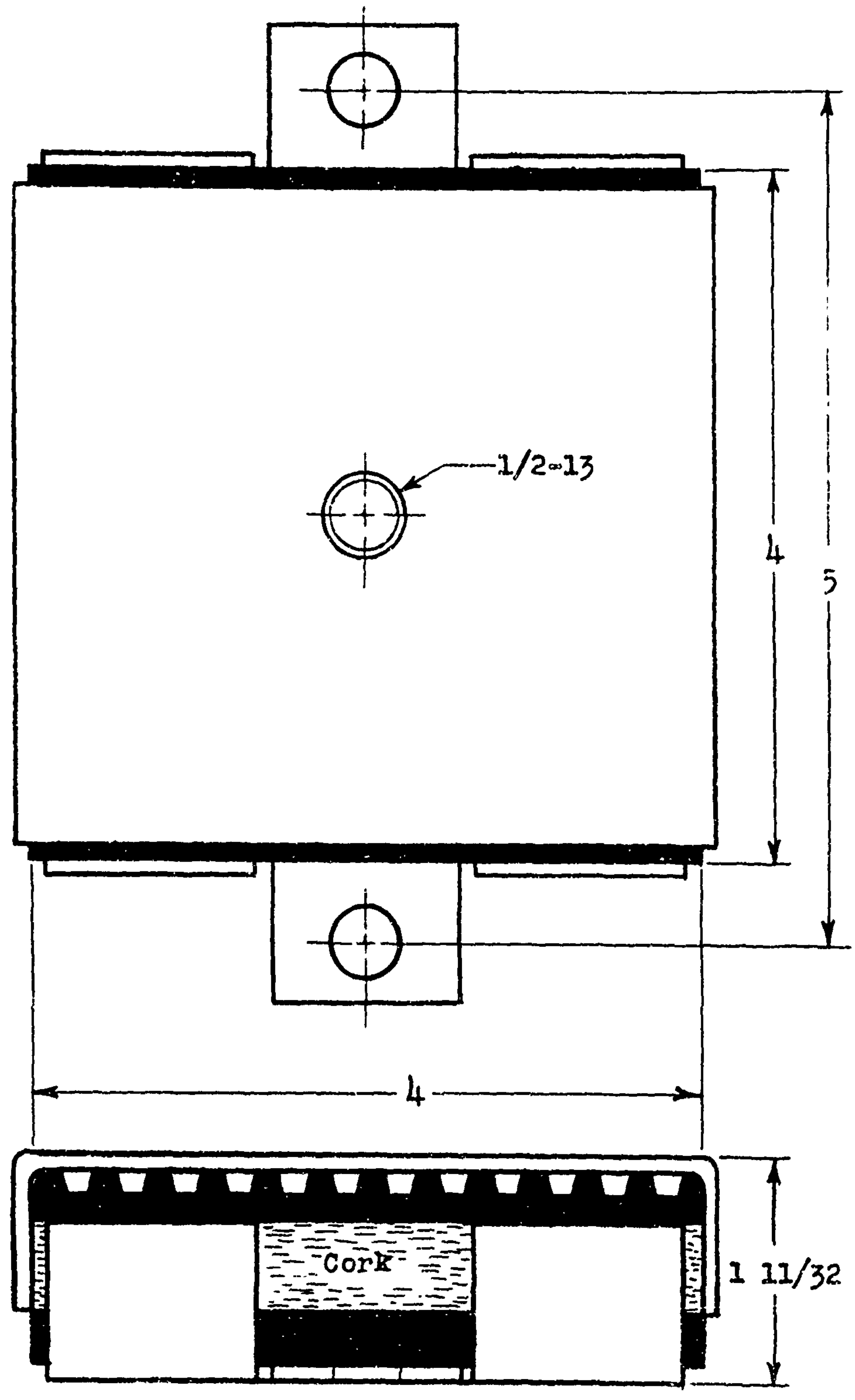
Figure VI-2
Bushings Inc.
Vibro-Leveler
Type 3100
Test No. 134V

Figure VI-3



Hamilton Kent Manufacturing Co.
Type H Rexon Mounts
Test Nos. 066H & 157H

Figure VI-4



Korfund Elasto-rib Damper
Type ER/D-4
Test No. 175K

Figure VI-5

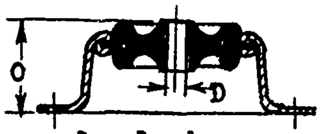
Isolators Manufactured by the Lord Manufacturing Co.

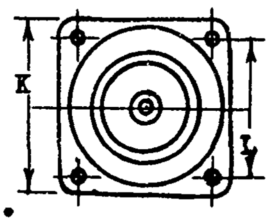
Lower Loads

Series	D	L	O
153	.257	1 15/16	1 1/16
204	.391	2 1/2	1 1/2

Higher Loads

Series	D	L	O
102	.166	1 3/8	23/32 to 7/8
204	.391	2 1/2	1 1/2 to 1 11/16



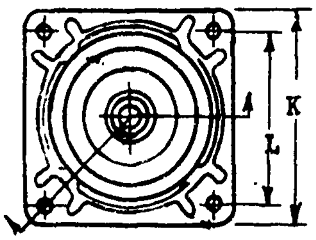


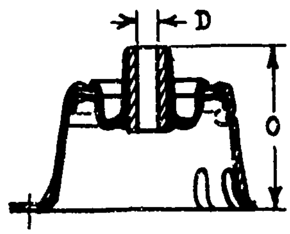
Low Load
Series 153 & 204 Test Nos. 007L,034L,035L,063L,095L

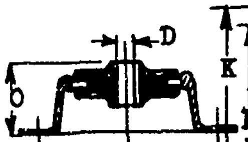
High Load
Series 102 & 204 Test Nos. 005L, 008L, 114L, 132L

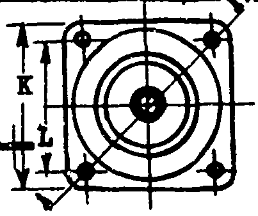
Series	D	K	L	O
156	.257	2 3/8	1 15/16	1 13/16
206	.391	3	2 1/2	1 63/64

Series	D	K	L	O
150	.257	2 3/8	1 15/16	1 1/16
200	.391	3	2 1/2	1 1/2
200X	.391	3	2 1/2	2 5/16



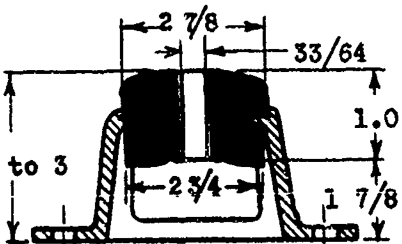


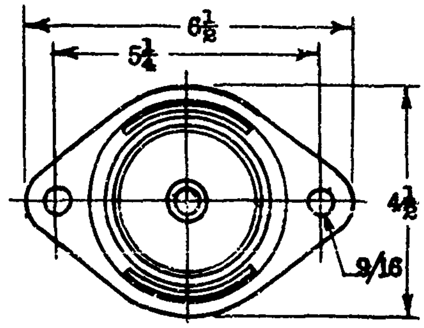




Series 156 & 206
Test Nos. 012L, 033L, 039L, 068L

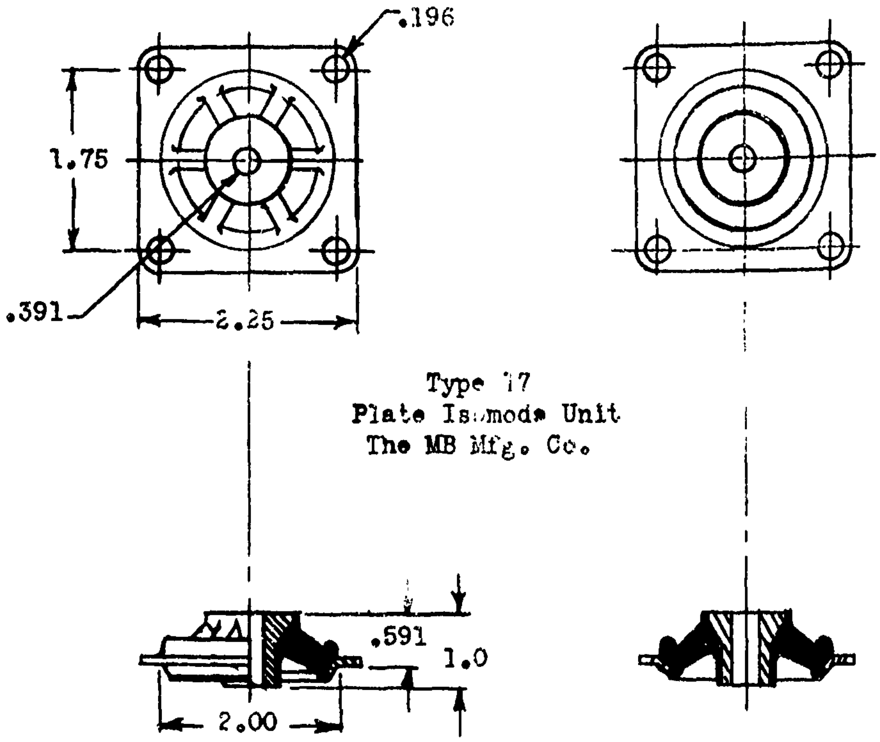
Series 150, 200 & 200X Test Nos. 006L, 042L, 062L, 094L, 111L





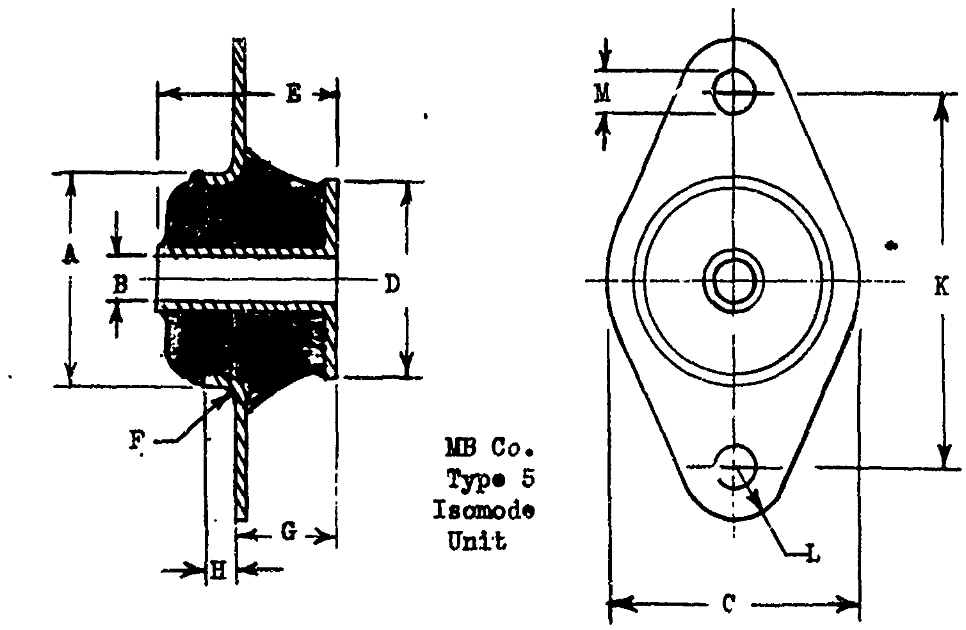
Series 279, 281 & 283
Test Nos. 151L, 152L & 153L

Figure VI-6



Type 17
Plate Isomode Unit
The MB Mfg. Co.

Test Nos. 032M, 036M, 061M, 091M & 097M



MB Co.
Type 5
Isomode
Unit

Dimensions in inches

Type	A	B	C	D	E	F	G	H	K	L	M
507	2.03	.437	2.50	1.87	1.75	.12	.99	.37	3.50	.50	.406
508	2.00	.500	2.75	2.00	2.00	.15	1.06	.58	3.75	.50	.406
510	2.25	.625	3.25	2.75	2.25	.15	1.22	.68	4.25	.50	.406

Test Nos. 092M, 098M, 112M, 115M, 133M, 154M, 171M, 172M & 173M

Appendix B

Table of Test Results

Appendix B

Table of Test Results

In the list that follows, there are given the isolators tested on this contract. Each isolator is designated by a number with a suffix letter which denotes the manufacturer, that is,

Load Range (pounds)	Number Range
0 - 10	001 - 030
11 - 30	031 - 060
31 - 50	061 - 090
51 - 70	091 - 110
71 - 90	111 - 130
91 - 110	131 - 150
111 - 150	151 - 170
151 - 200	171 - 190
201 - 300	191 - 210
301 -	211 -

The suffix letters which denote the isolator manufacturer are:

Company	Suffix
The Barry Corporation 179 Sidney Street Cambridge 39, Mass.	B

Bushings, Inc.

4358 Coolidge Highway
PO Box 189
Royal Oak, Michigan | V

Bushings, Inc. 4358 Coolidge Highway, PO Box 189, Royal Oak, Michigan	V
Hamilton-Kent Manufacturing Co. Kent, Ohio	H
The Korfund Co. 48-15 Thirty Second Place, Long Island City 1, N. Y.	K
Lord Manufacturing Co. Erie, Pa.	L
The M. B. Manufacturing Co. 1060 State Street, New Haven 11, Conn.	M

Thus, a complete isolator number might be 019K, which would be the serial number assigned to an isolator in the load range 0 - 10 pounds fabricated by The Korfund Company.

These numbers were used as test numbers as well.

In the list is given a tabulation of some of the static and dynamic characteristics of each isolator tested. Following the list are drawings of all isolator types tested under this contract.

TABLE OF TEST RESULTS

Test No.	Rated Load Range lbs.	Test Load lbs.	SAE-ASTM Rubber Type	Stiffness Static lb/in	Stiffness Dynamic lb/in	$\frac{k_{dy}}{k_{st}}$	Damping Ratio c/c_c
001L	4	2.1	RN-435-911S-BDFK	63.2	73.7	1.17	0.0373
002B	5-10	9.89		73.2	146	2.00	0.0680
003B	6-14	9.89		161	141	.876	0.0184
005L	6	2.1	RN-440-908S-BDFK	112	126	1.13	0.0205
006L	10-15	9.89	RN-435-911S-BDFK	148	158	1.07	0.0182
007L	10	9.89	RN-435-911S-BDFK	108	112	1.04	0.0271
008L	10	9.89	RN-440-908S-BDFK	180	171	.95	*
009B	10-26	20.36		345	533	1.55	0.0503
012L	9	9.89	RN-435-911S-BDFK	57.1	61.7	1.08	0.0645
032M	16.2-26	20.36	RN-430-ABDFKH	290	409	1.41	0.0750
033L	20-40	20.36	RN-544-817S-BDFK	102	169	1.65	0.0486
034L	20	20.36	RN-435-911S-BDFK	207	313	1.51	0.0219
035L	20	20.36	RN-435-911S-BDFK	201	230	1.14	0.0503
036M	20-32	20.36 40.0	RN-530-ABDFKH	351 351	438 386	1.25 1.10	0.0503 0.0590
038B	30-125	66.1 67.6		128	131	1.02	0.0182
039L	13	9.89	RN-435-911S-BDFK	90.0	57.0	.636	0.0223
042L	20	20.36	RN-435-911S-BDFK	305	380	1.25	0.0200
061M	35-56	40.0	RN-430-ABDFKH	642	1120	1.75	0.0558
062L	35-70	40.0	RN-541-913S-BDFK	503	693	1.38	0.0558
063L	35	40.0	RN-435-911S-BDFK	290	371	1.28	0.0212
064B	40-120	66.1	RN-430-AB	2200	4930	2.24	0.0661
066H	40	40.0		485	1720	3.55	0.104
068L	45	40.0	RN-544-817S-BDFK	239	332	1.39	0.0173

Test No.	Rated Load Range lbs.	Test Load lbs.	SAE-ASTM Rubber Type	Stiffness Static lb/in	Stiffness Dynamic lb/in	$\frac{k_{dy}}{k_{st}}$	Damping Ratio c/c_c
091M	51.8-83	66.1	RN-630-ABDFKH	1000	1240	1.24	0.0567
092M	60-180	66.1	RN-425-ABDFKH	1350	1530	1.13	0.0722
093B	60-250	196.9		290	291	1.00	0.0281
094L	60-120	66.1	RN-541-910S-BDFK	860	976	1.13	0.0295
095L	60	66.1	RN-544-911S-BDFK	578	677	1.17	0.0848
097M	62.5-100	66.1	RN-630-ABDFKH	1100	1530	1.39	0.0717
098M	50-150	56.5	RN-325-ABDFKH	1050	1670	1.59	0.0503
		66.1		1070	1630	1.52	0.0613
		76.0		1130	1930	1.71	0.0596
111L	75-120	76.0	RN-545-911S-BDFK	1010	1180	1.16	*
112M	75-225	147.6	RN-525-ABDFKH	1000	2180	2.18	0.0960
		196.9		1470	2220	1.51	0.0927
114L	87	97.2	RN-545-911S-BDFK	815	1100	1.35	0.0503
115M	90-270	147.6	RN-325-ABDFKH	1430	2970	2.07	0.0566
132L	100	97.2	RN-546-912S-BDFK	921	1100	1.19	0.0503
133M	110-330	147.6	RN-425-ABDFKH	1920	3190	1.66	0.0800
134V	100	97.2	RN-625	2570	7520	2.93	0.0661
151L	120	97.2	RN-545-911S-BDFK	800	1200	1.50	0.0860
152L	120	97.2	RN-541-910S-BDFK	572	719	1.26	0.0710
153L	120	97.2	RN-546-914S-BDFK	1150	1430	1.25	0.0905
154M	130-390	147.6	RN-525-ABDFKH	2960	6680	2.26	0.0583
157H	150	147.6		1290	5470	4.24	0.100
171M	160-480	295.1	RN-625-ABDFKH	2370	5930	2.50	0.0790
172M	160-480	295.1	RN-325-ABDFKH	2270	4360	1.92	0.0865
173M	190-570	295.1	RN-425-ABDFKH	3230	5520	1.71	0.115
		397.1		2950	5870	1.99	0.0900
175K	160-560	295.1		4170	17,400	4.18	0.0970

*Readings unobtainable due to resonances in test system

Appendix C

Isolator Load Range Chart

Appendix C

Isolator Load Range Chart

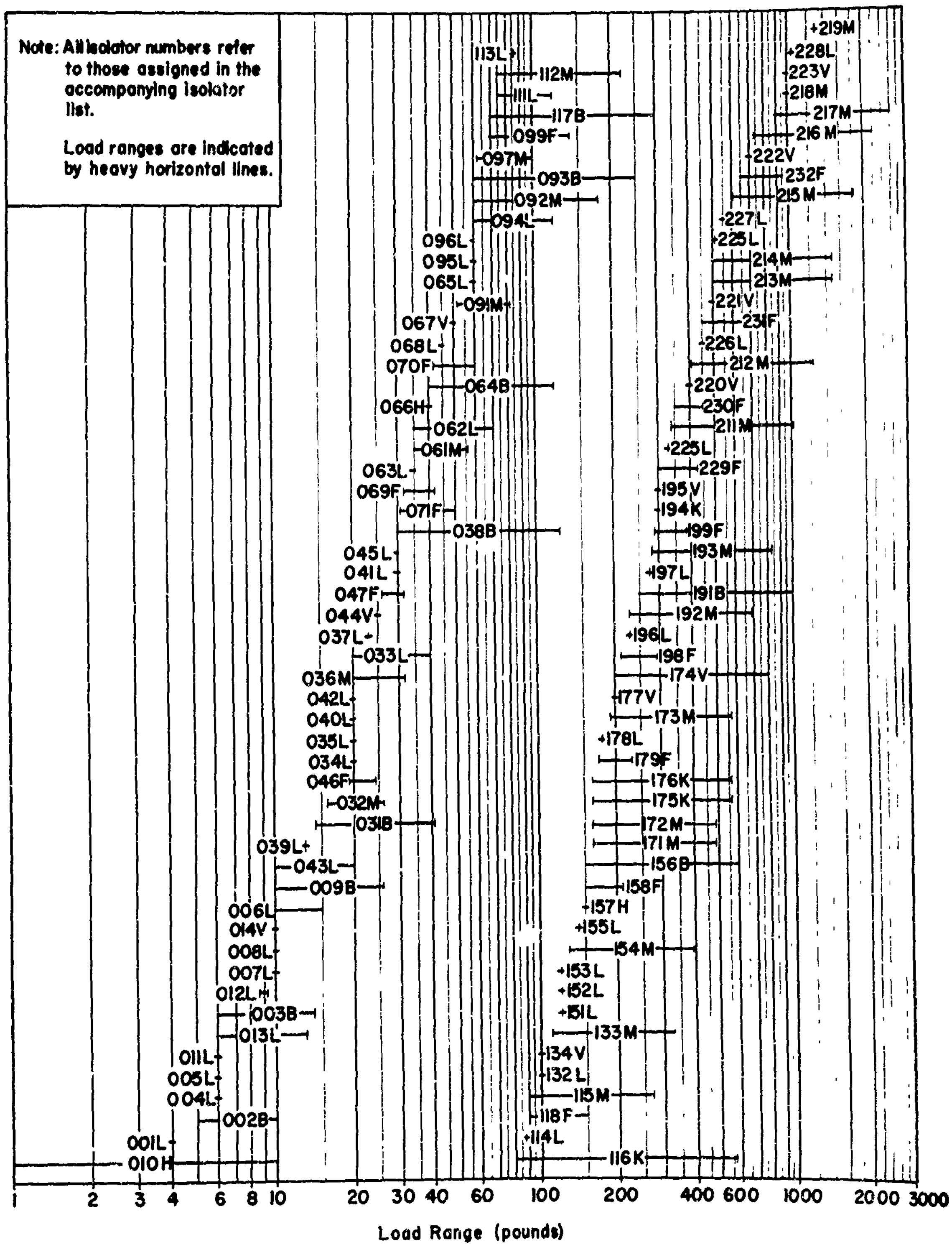
If the load that a resilient mounting will be required to support is known, then the chart on the following page can be used to determine the specific mountings that are capable of supporting it. The chart gives no other information than the isolator test numbers of the particular mountings that fall in the required load range.

For example, let the load an isolator is required to support be 25 pounds. By reading vertically up the ordinate designating this value, we find that the following resilient mountings are designed to support a load of this magnitude: 009B, 031B, 032M, 033L, 036M and 044V. In addition, there are several others which come very close to this value. More complete information concerning the characteristics of these six mountings can be found in Appendices A and B, and in the appropriate manufacturer's literature.

The chart can be used as well in conjunction with the "Method of Selecting Resilient Mountings" given in Section IV.

The chart lists all of the mountings that have been received on this contract. Thus far, only forty-six of them have been tested completely. The results of those tests have been compiled in Appendix B.

Mechanical Engineering Department
Illinois Institute of Technology
Contract N7-onr-32904
15 June 1950



Load Range of Isolators

Appendix D

Graphical Representations of Data

and

Photographs of Mountings

OEC

Appendix D

Graphical Representation of the Test Data

The following graphical representations of the data obtained for each isolator are given in this part of Section VI:

(a) the static load-deflection curve,

(b) the transmissibility vs frequency curve, and

(c) the decibel change (or logarithm to the base 10 of the velocity ratio) vs frequency curve.

The data from which these curves are plotted are given in a separate part of Section VI.

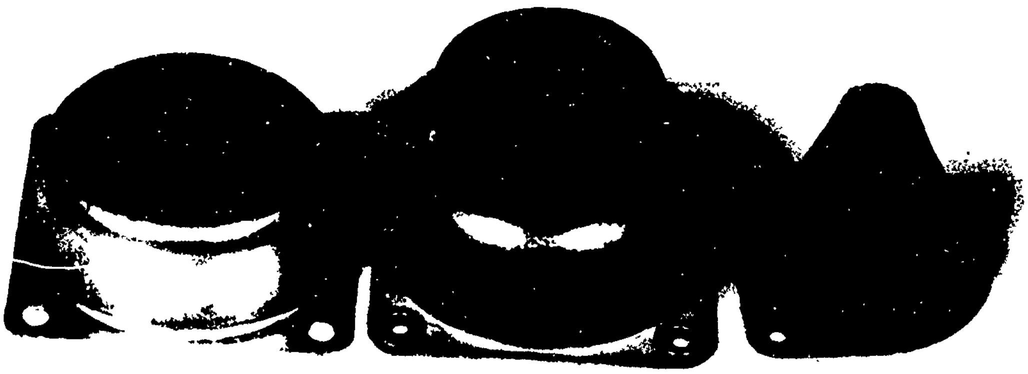
The system by which each curve is designated follows:

In the upper right-hand corner of each page there is a number which designates the particular isolator or test. Immediately following this isolator number, there is a letter suffix which denotes the type curve on the page. The small letter "a" is used to signify a static load-deflection curve; "b", a transmissibility vs frequency curve; "c", a decibel change vs frequency curve. For example, the symbol

008L-b

signifies that the curve on the page is the transmissibility curve for the resilient mounting denoted by 008L in the isolator list.

There are two sets of curves which do not indicate a resonant frequency. These are the transmissibility and decibel change vs frequency curves for isolators 008L and 111L. This omission will be corrected in a supplementary report.



LORD 150PH-4
001 L

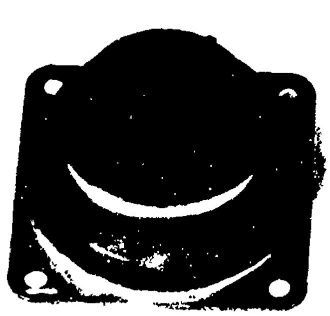
BARRY 236-10
002 B

BARRY 104-10
003 B

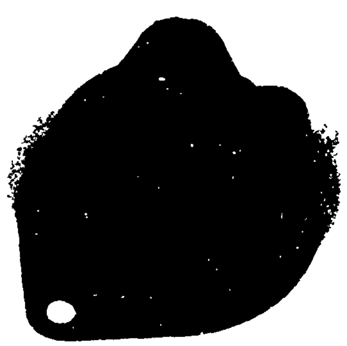
LORD 102PH-6
005 L

LORD 150PH-10
006 L

LORD 153PH-10
007 L

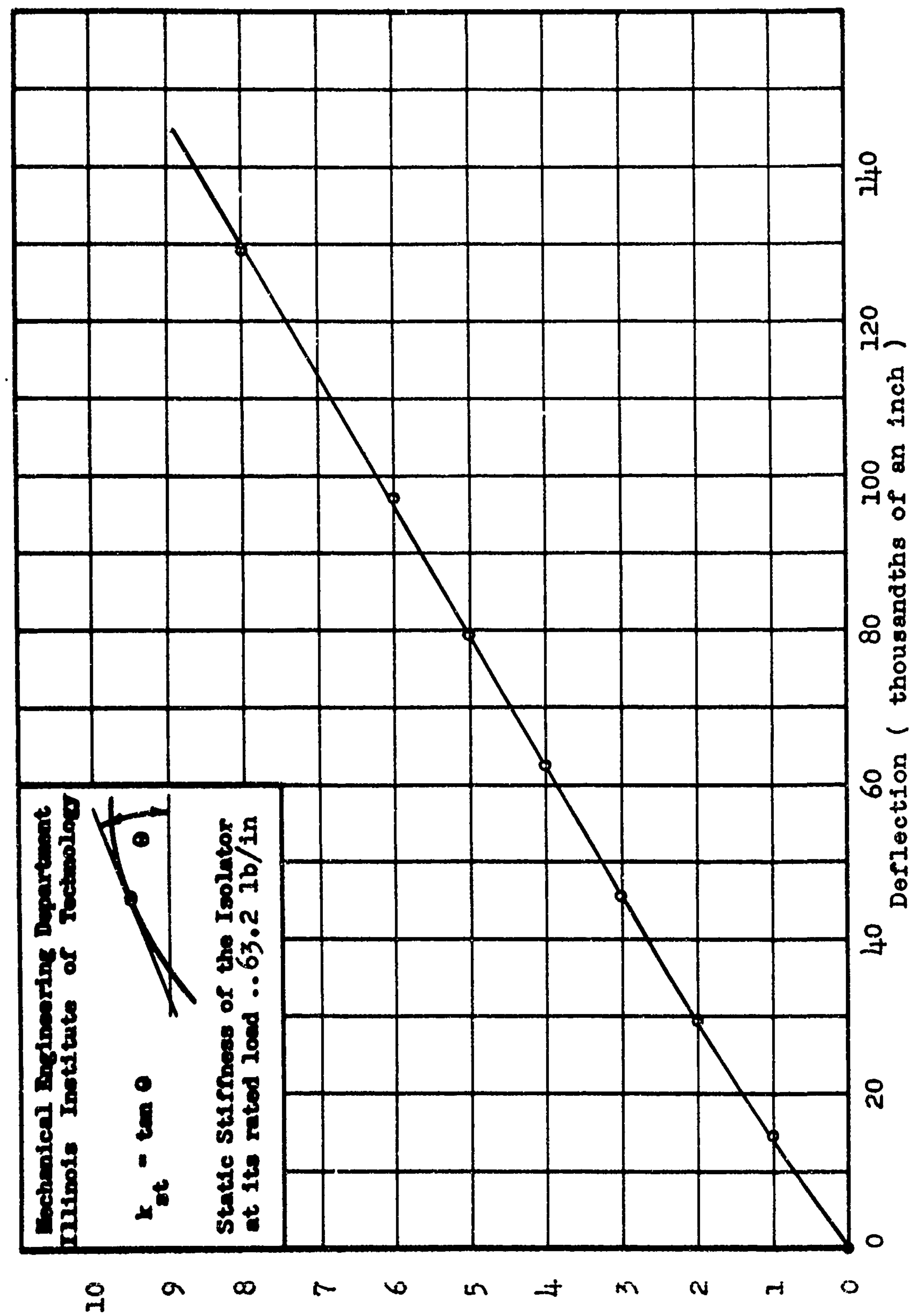


LORD 102PH-10
008 L

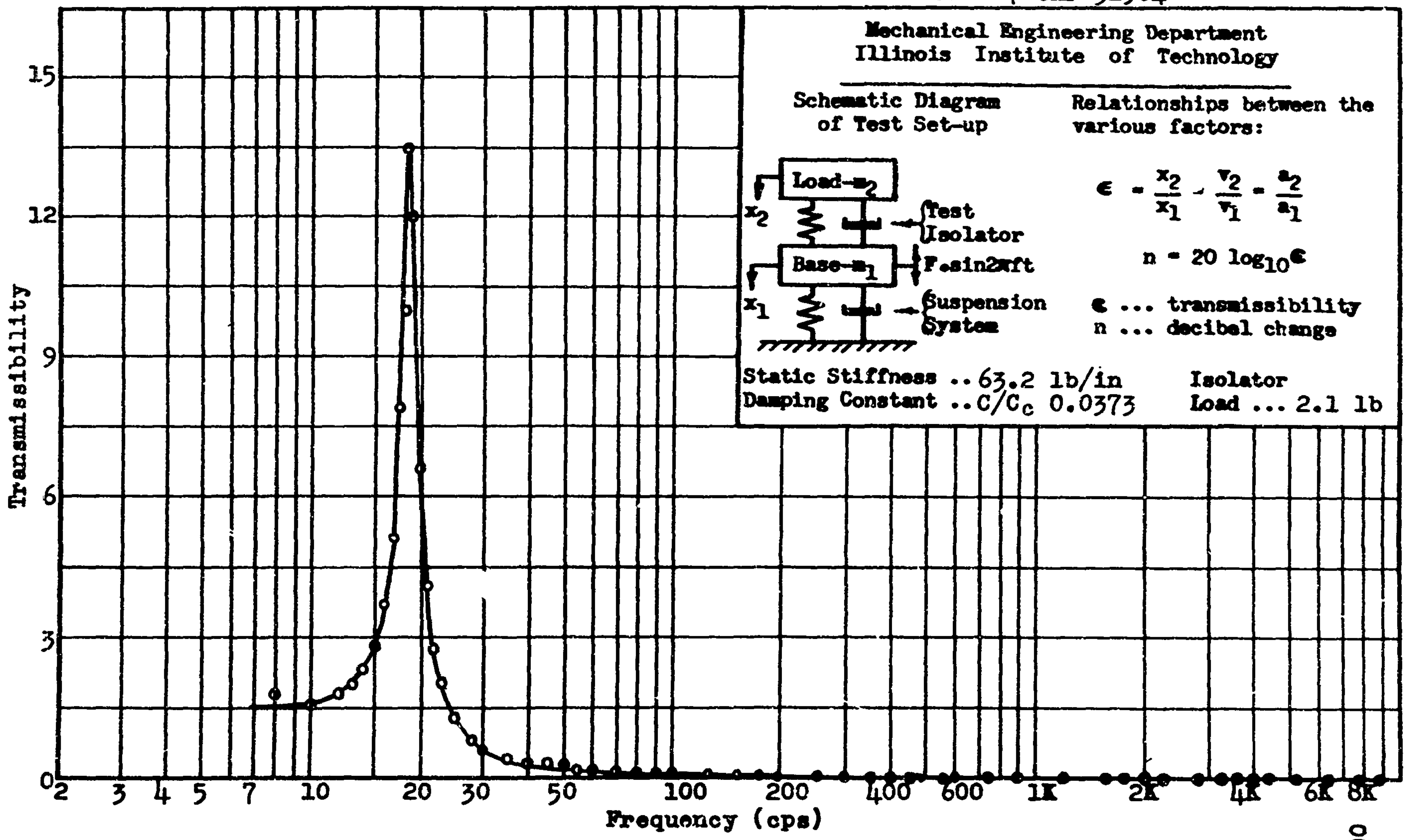


BARRY 104-20
009 B

PLATE VI-2



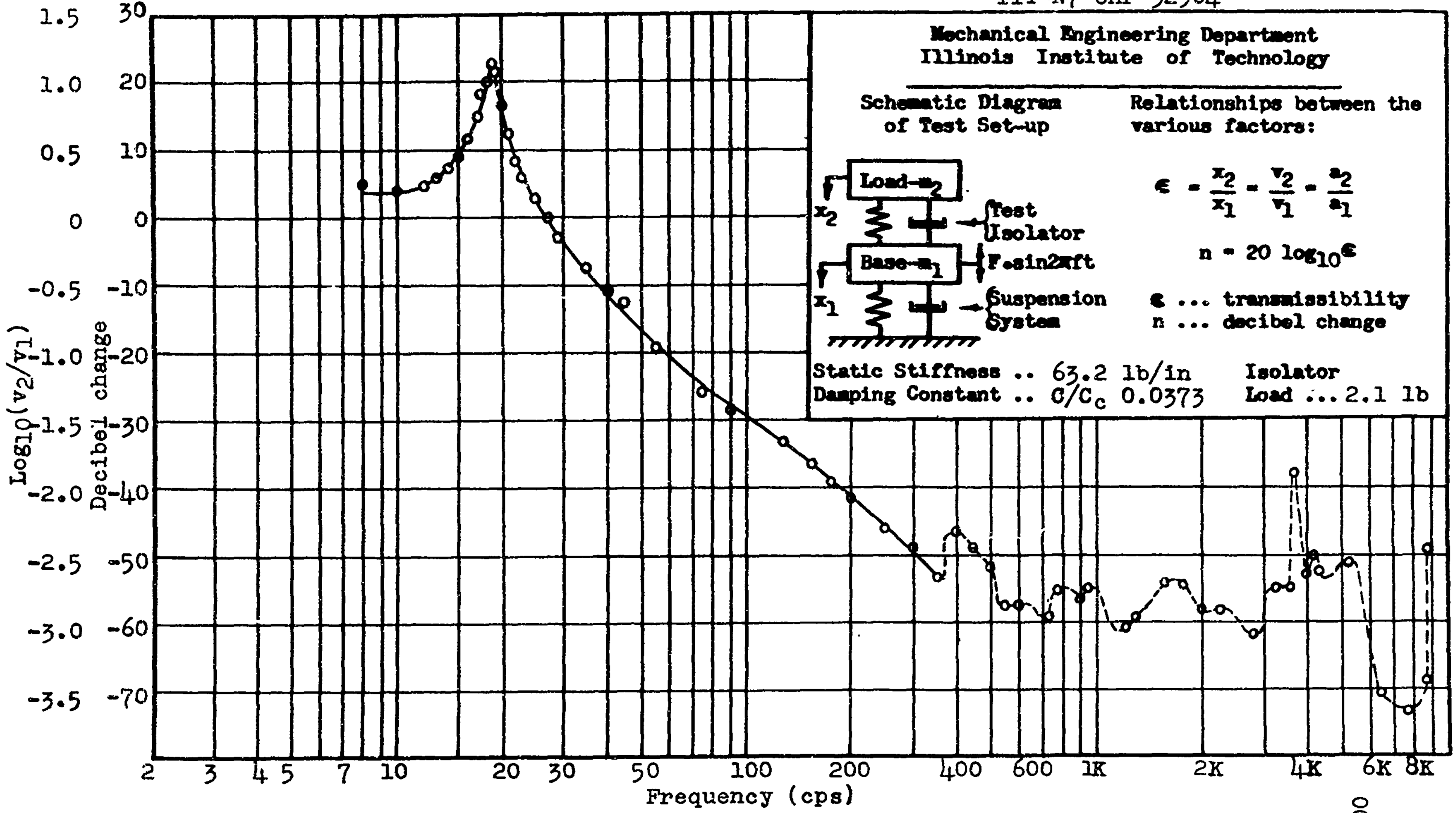
Load-Deflection Curve - Lord 150 PH 4



Transmissibility vs Frequency Curve - Lord 150 PH 4

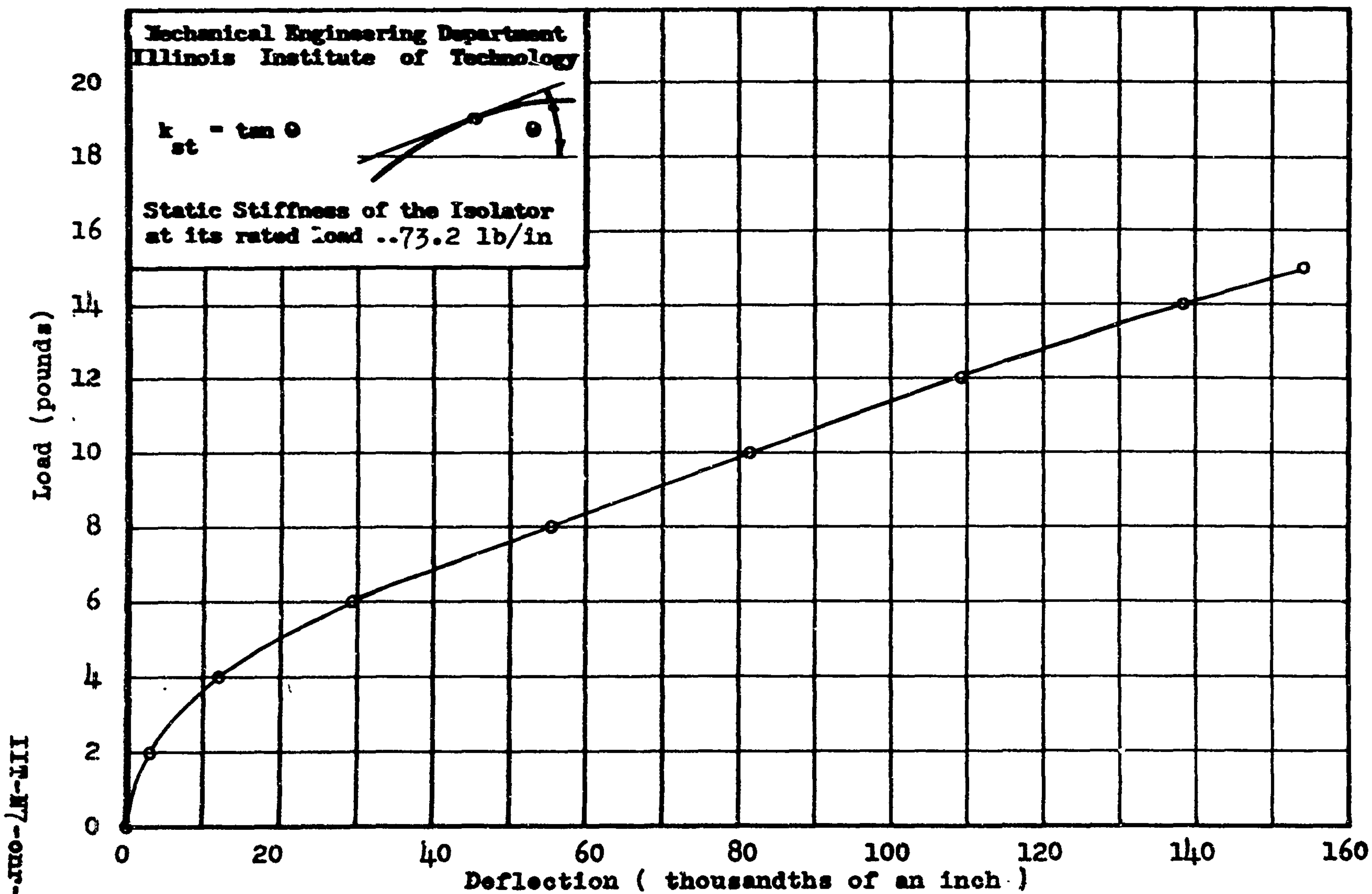
001L-b

IIT-N7-onr-32904



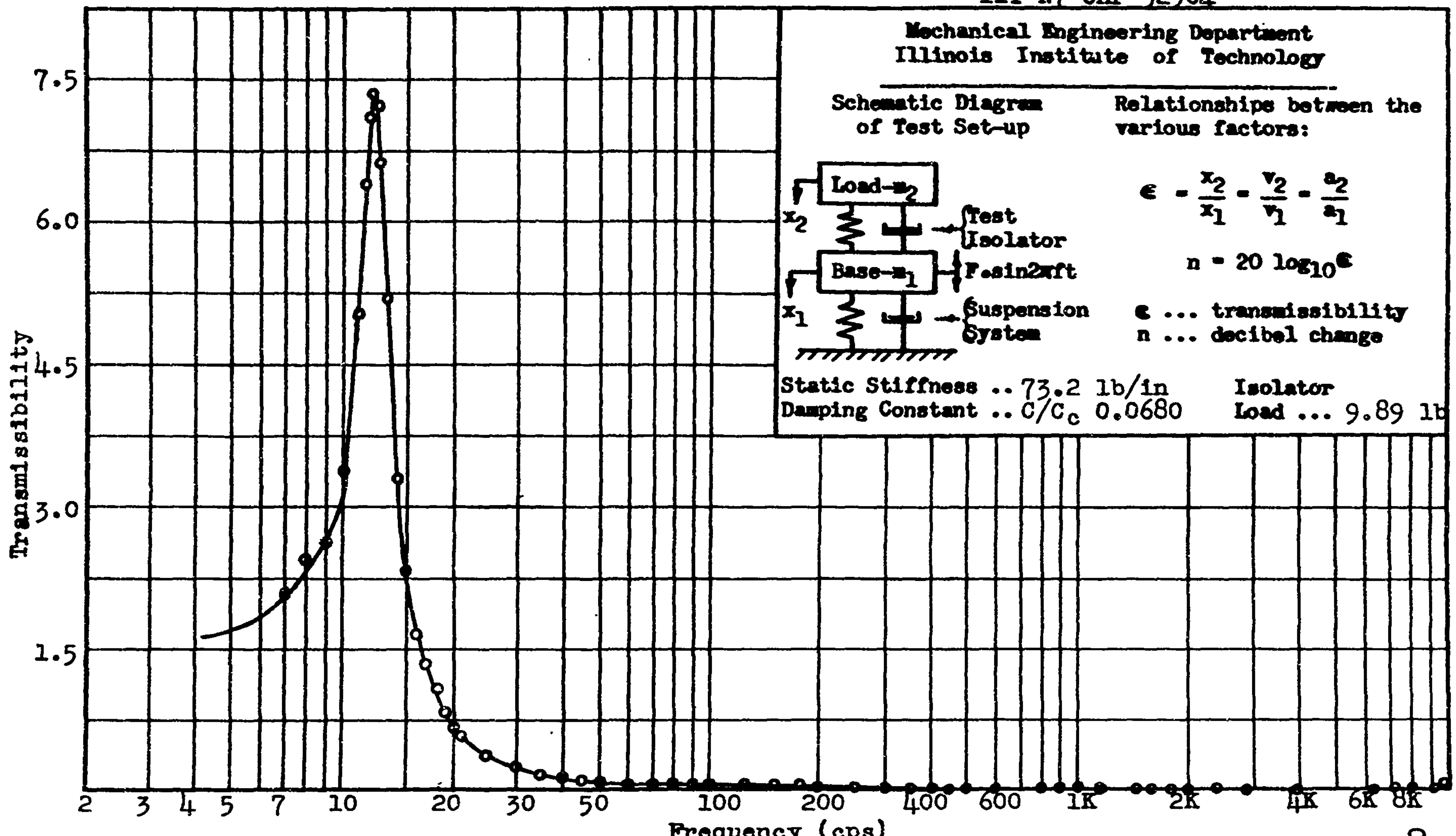
$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 150 PH 4

001L-c



Load-Deflection Curve - Barry 236-10

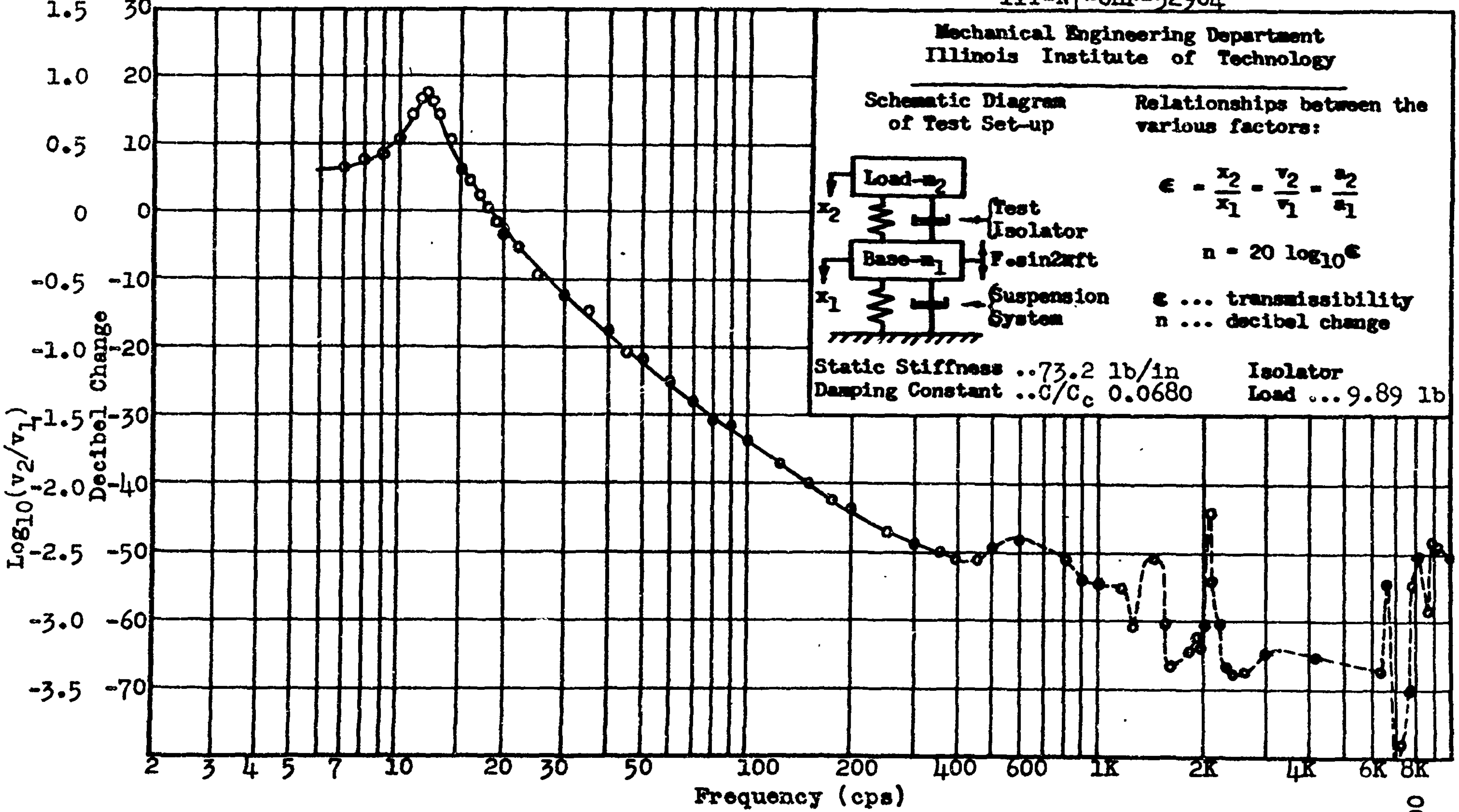
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Barry 236-10

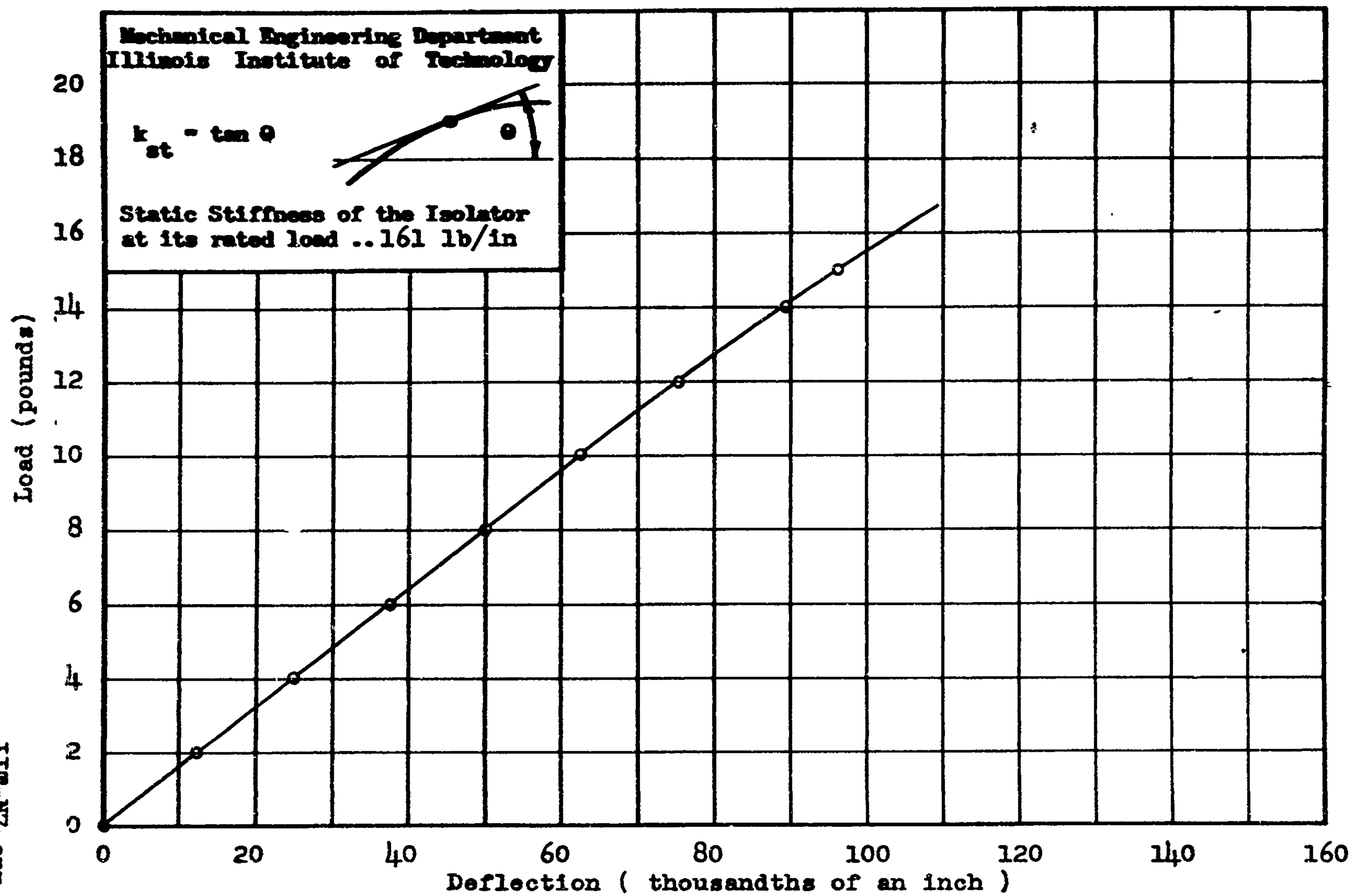
002B-b

IIT-N7-onr-32904



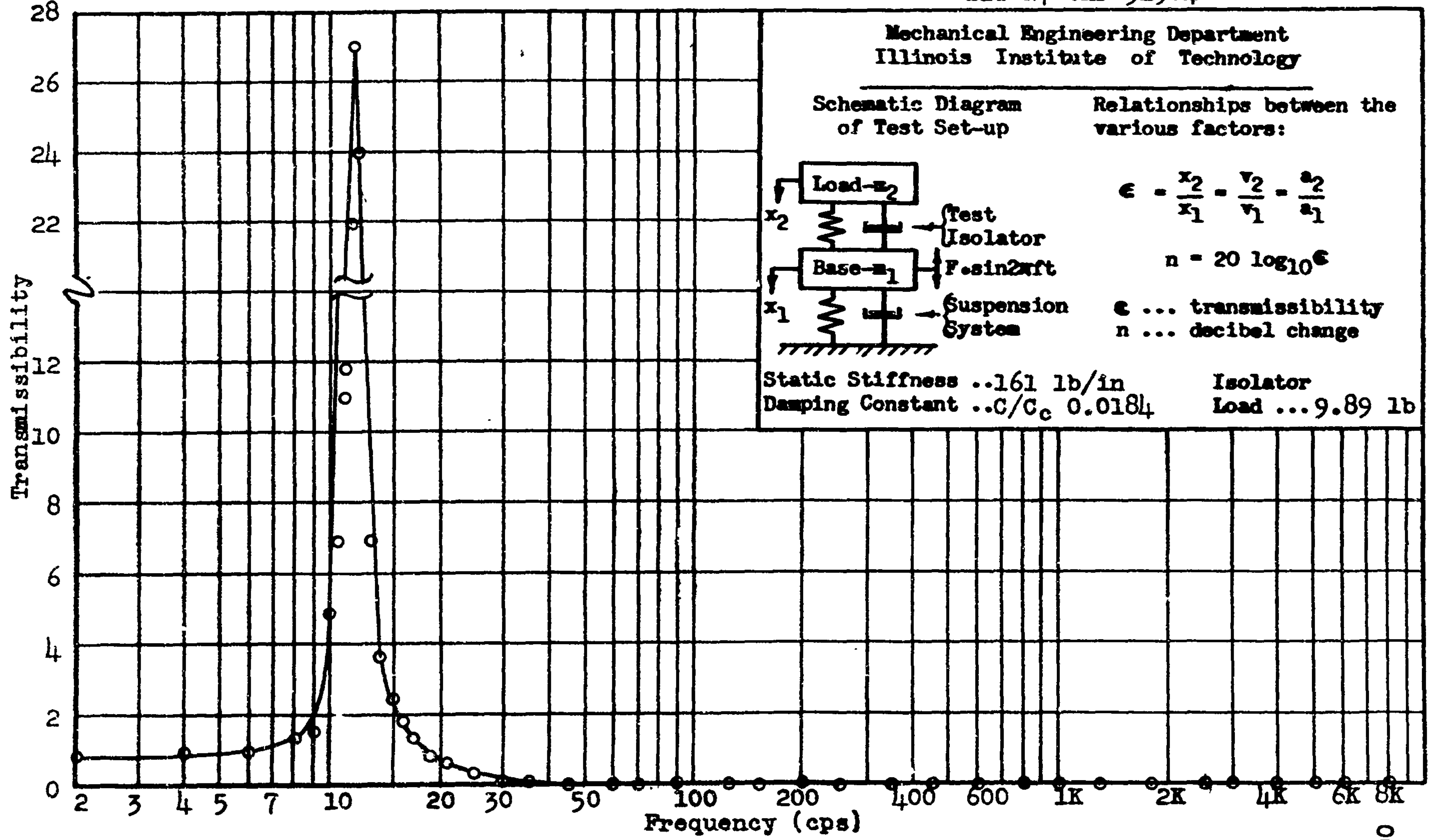
$\log_{10}(v_2/v_1)$ vs Frequency Curve - Barry 236-10

002B-c



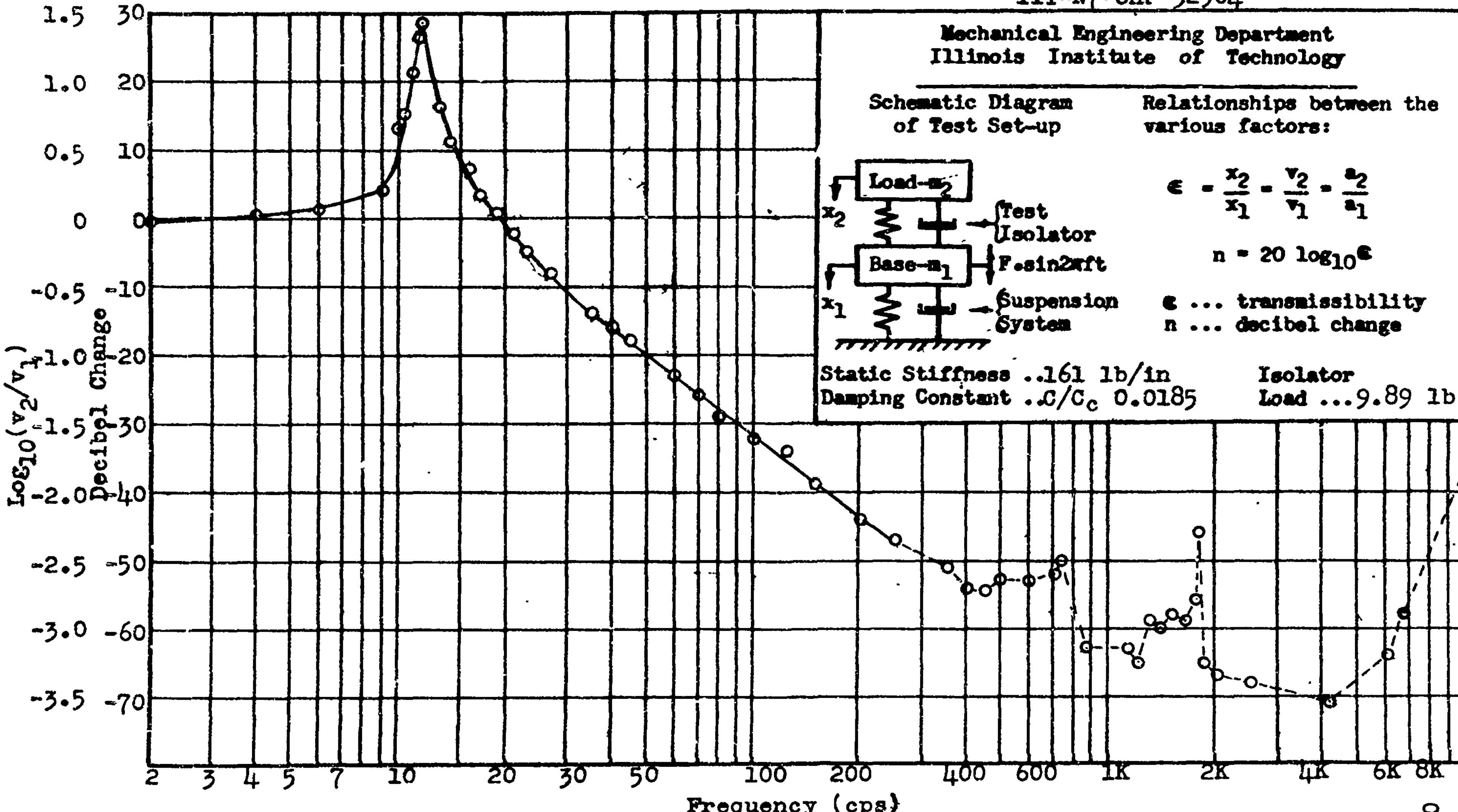
Load-Deflection Curve - Barry 104-10

IIT-N7-onr-32904



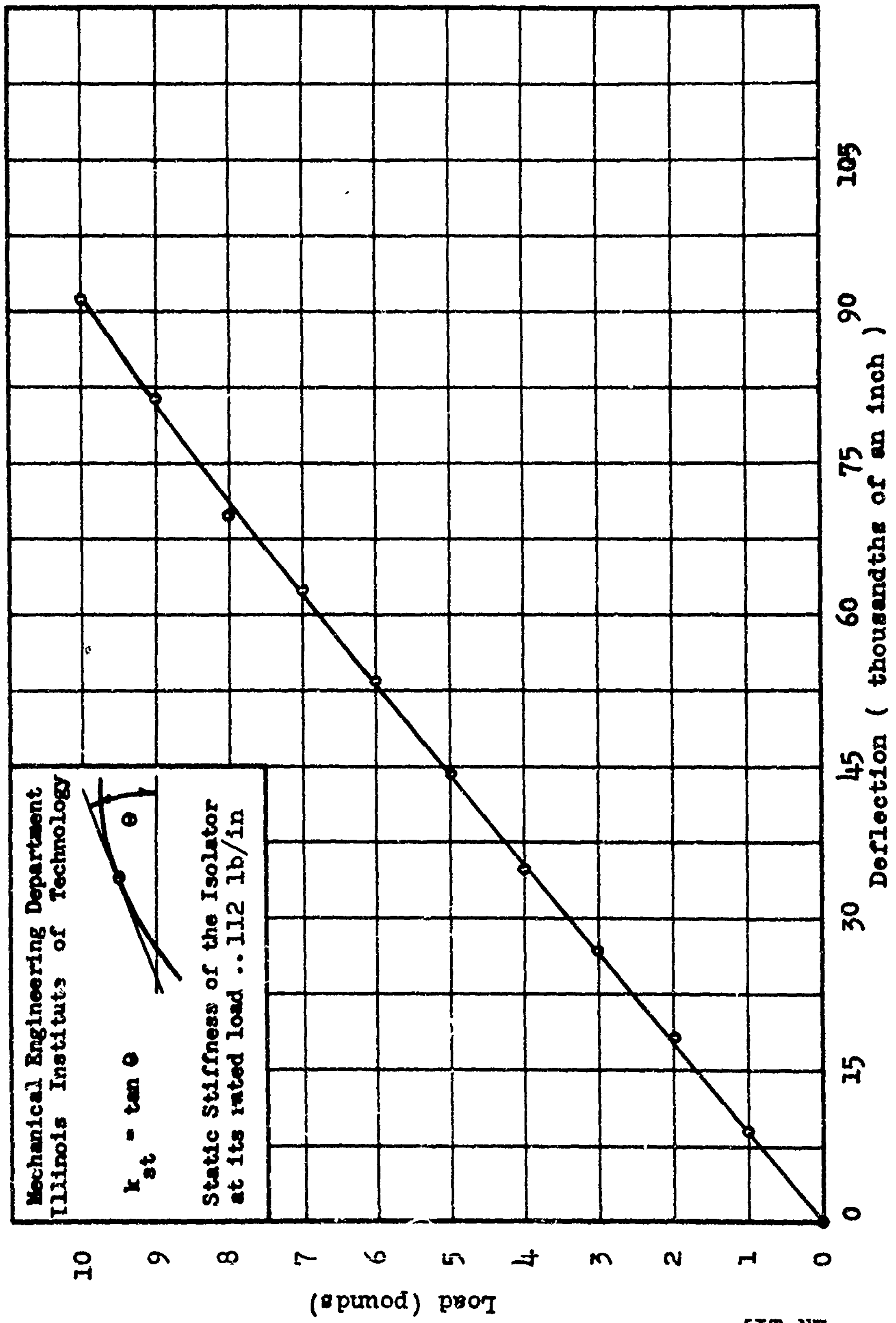
Transmissibility vs Frequency Curve - Barry 104-10

003B-b



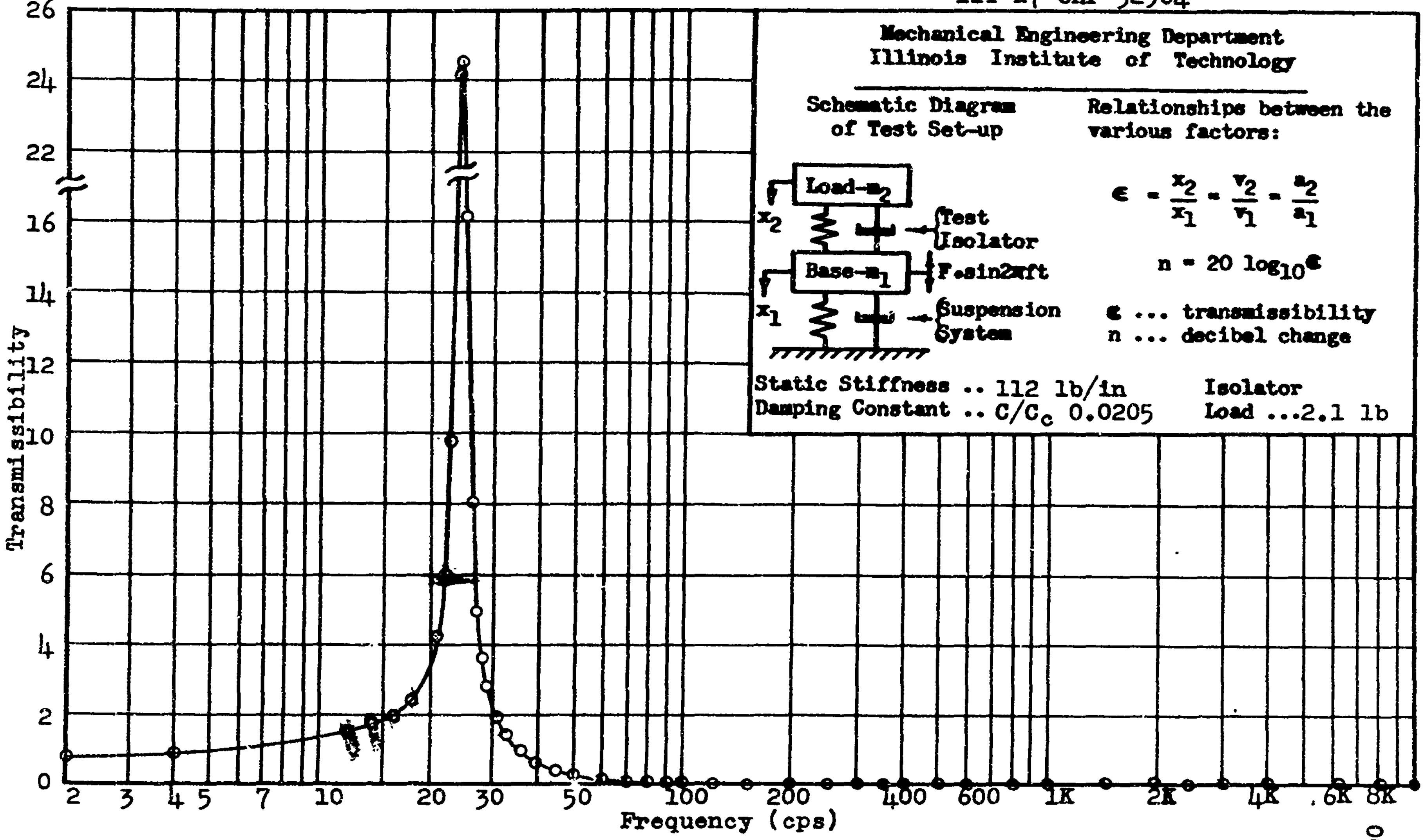
$\log_{10}(v_2/v_1)$ vs Frequency Curve - Barry 104-10

003B-c



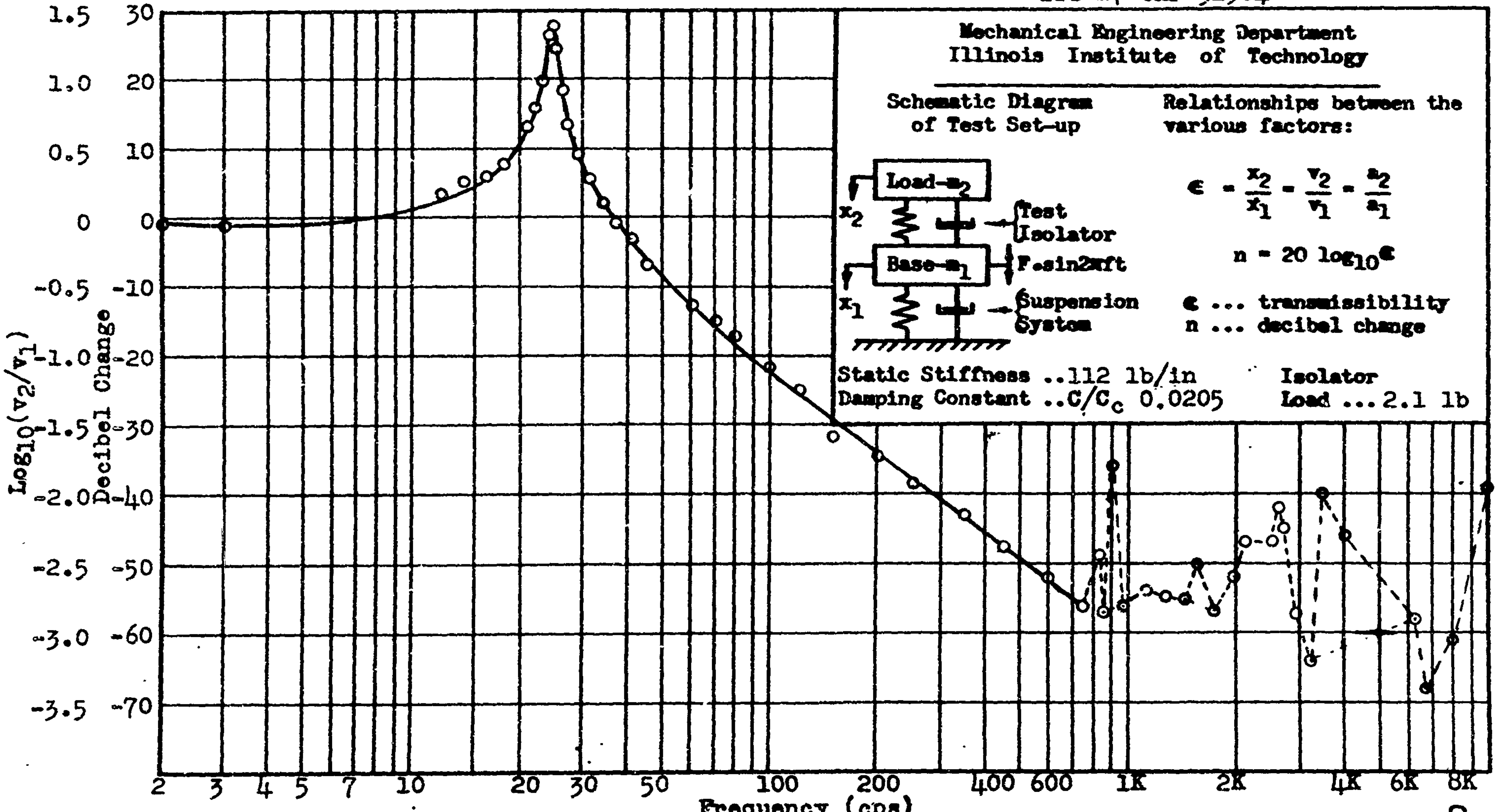
Load-Deflection Curve - Lord 102 PH 6

IIT-N7-onr-32904



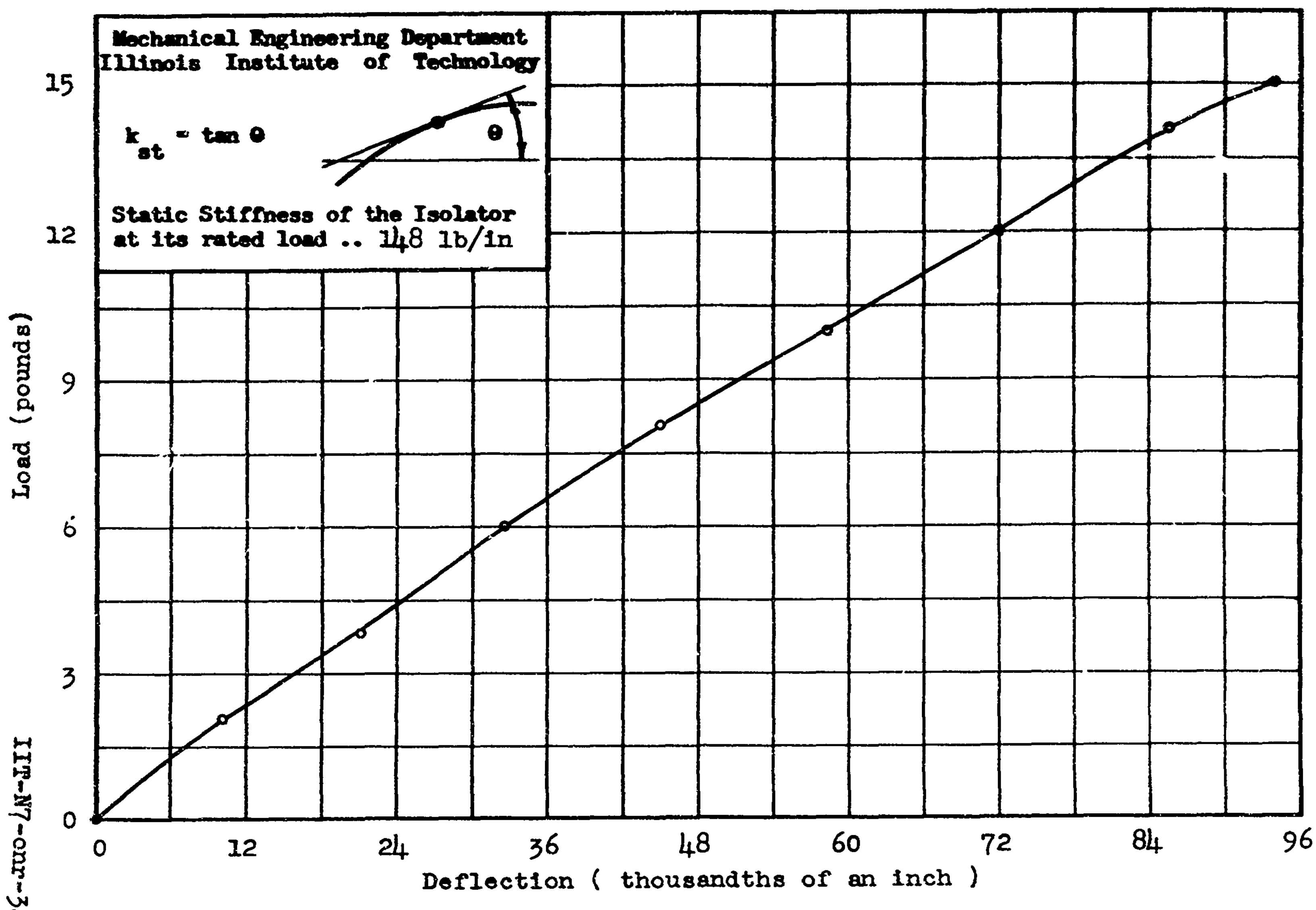
Transmissibility vs Frequency Curve - Lord 102 PH 6

005L-b

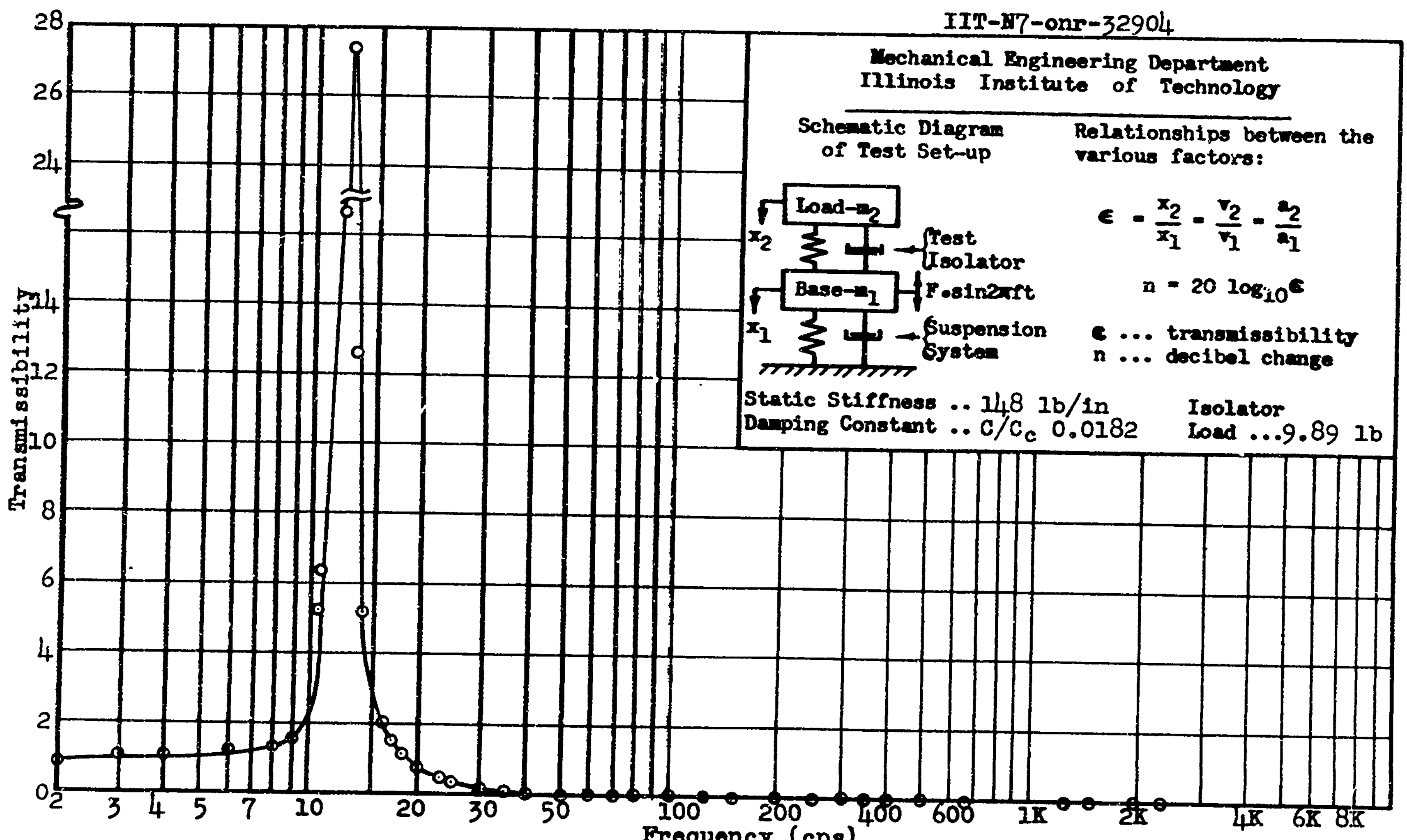


$\log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 102 PH 6

005L-c

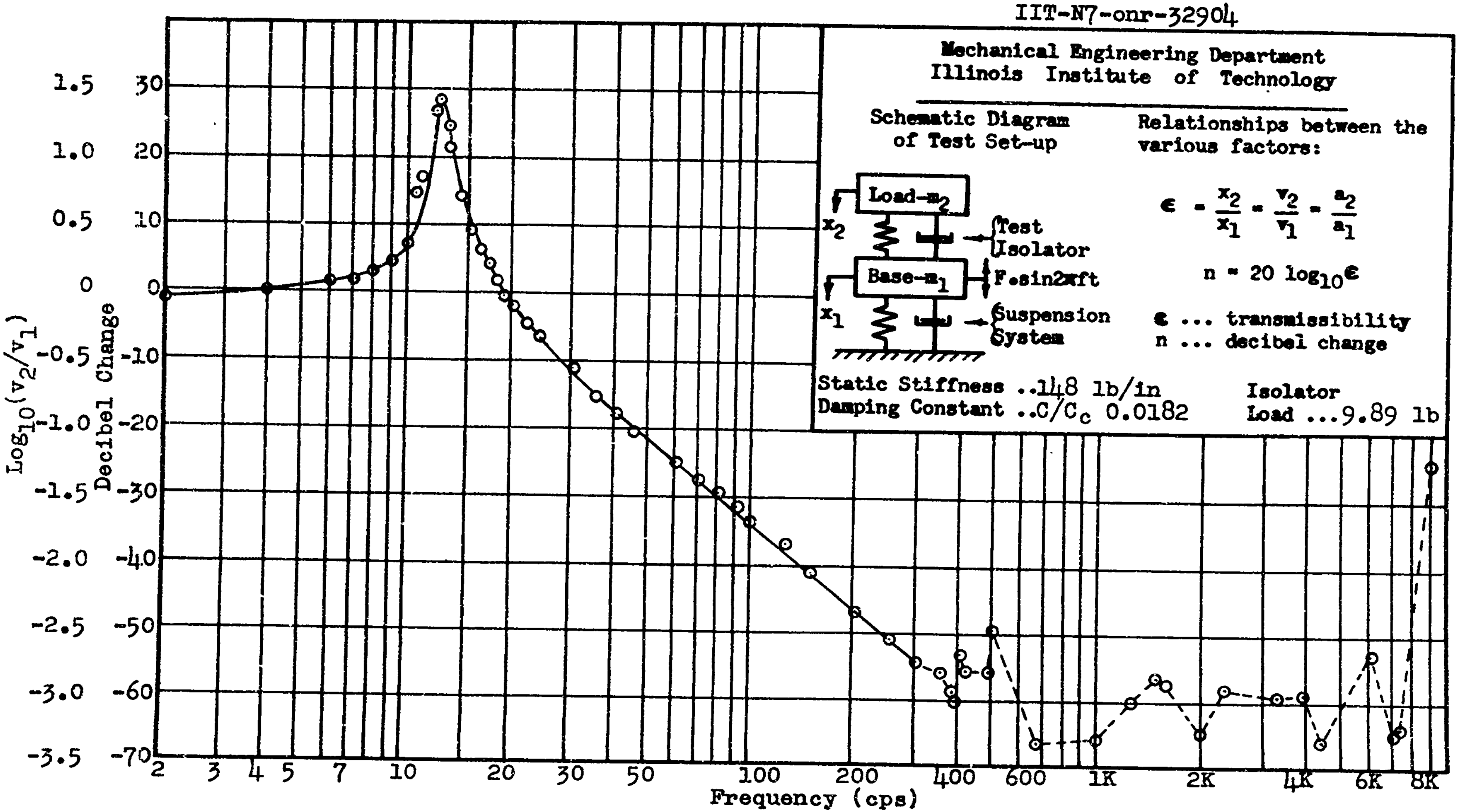


Load-Deflection Curve - Lord 150 PH 10



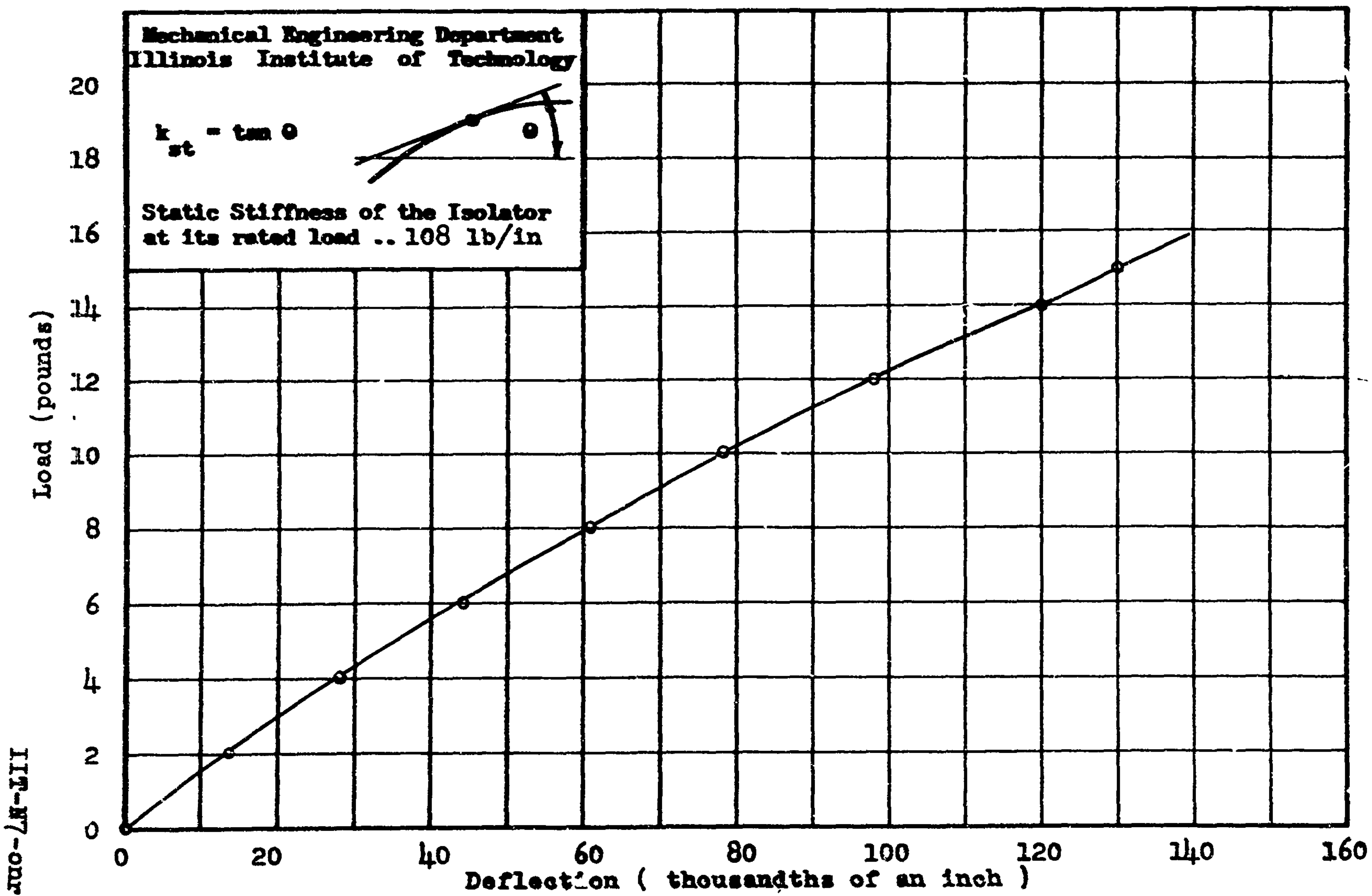
Transmissibility vs Frequency Curve - Lord 150 PH 10

006L-b



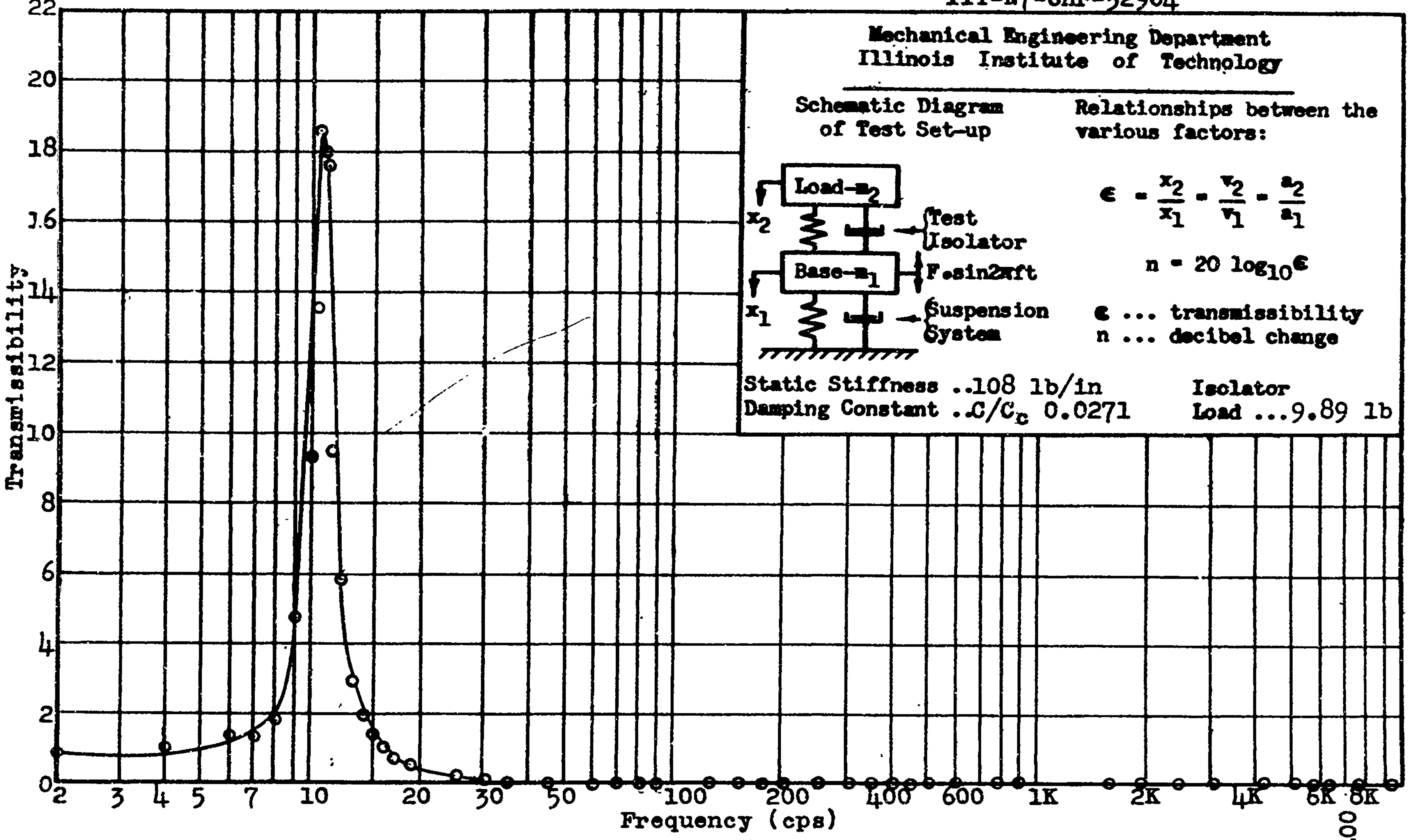
$\mathrm{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 150 PH 10

c-L900



Load-Deflection Curve - Lord 153 PH 10

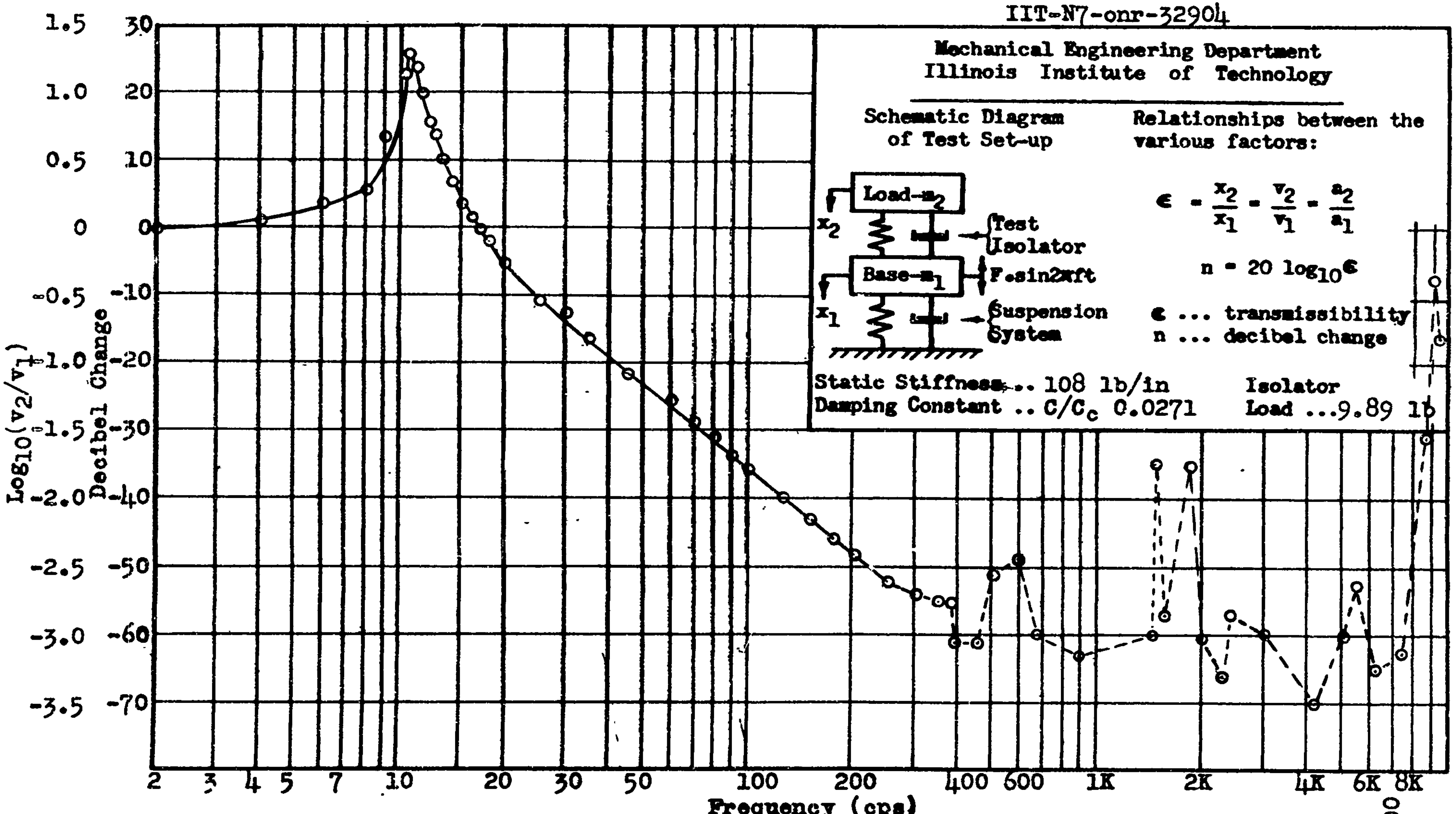
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Lord 153 PH 10

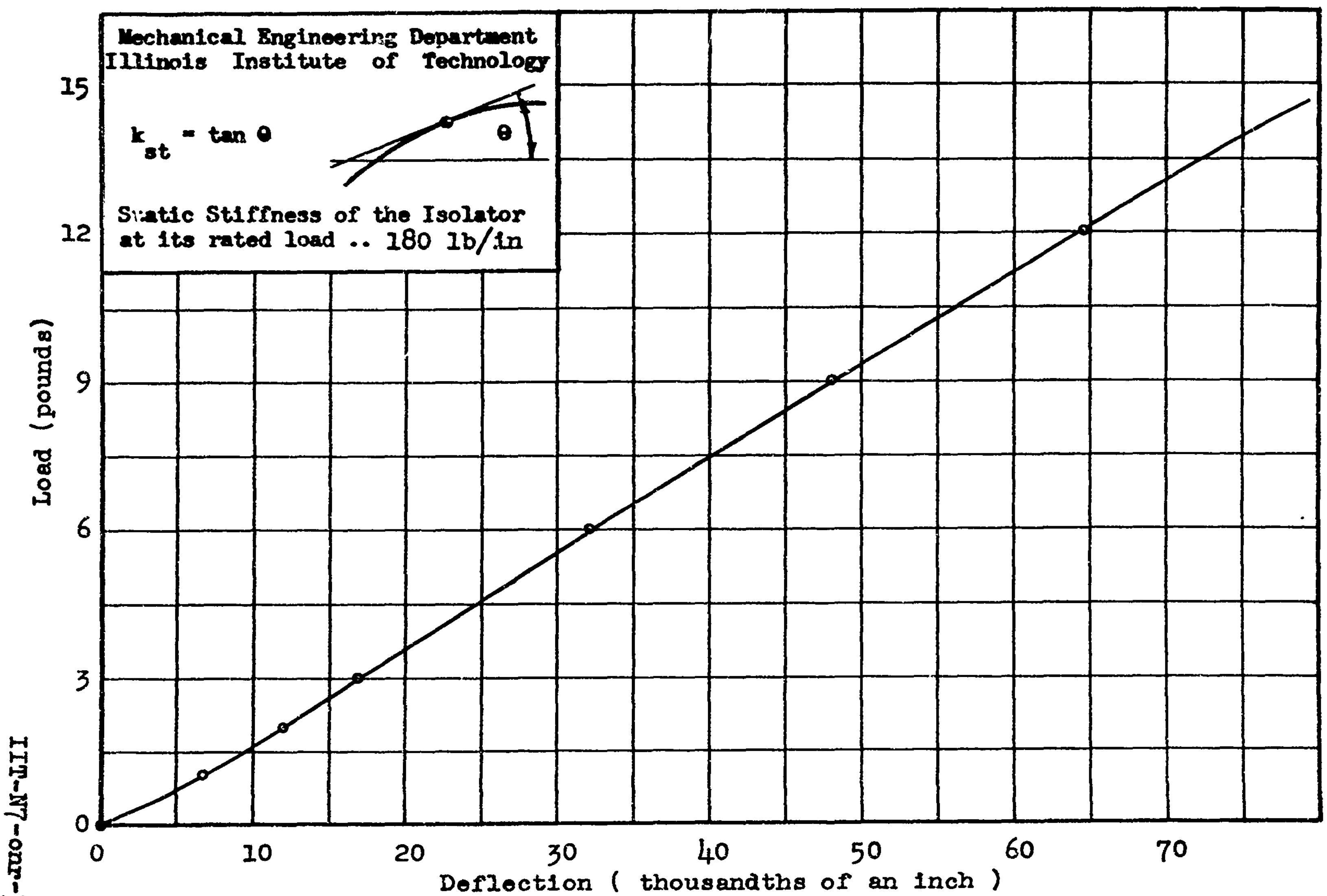
007L-b

IIT-N7-onr-32904



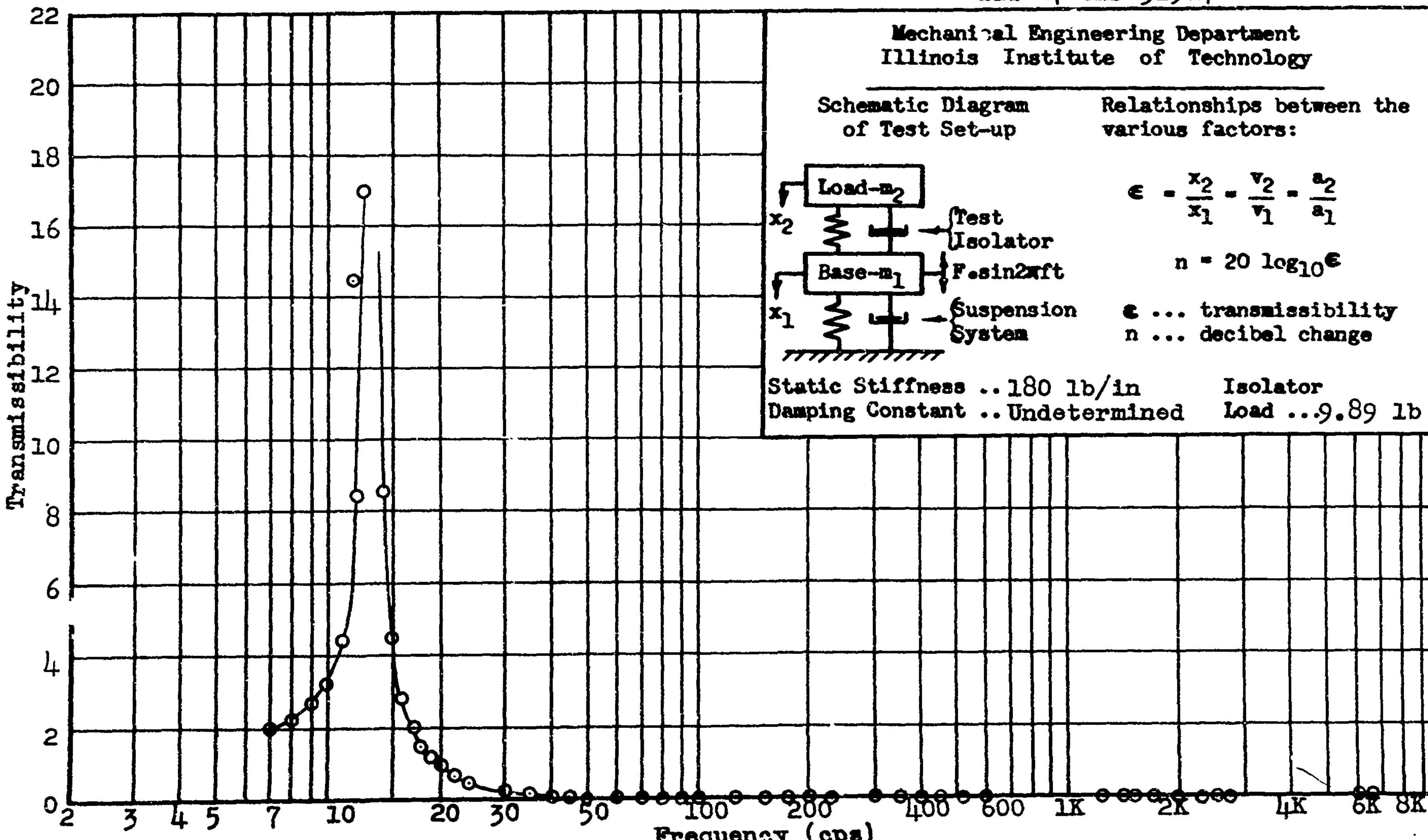
$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 153 PH 10

007L-c



Load-Deflection Curve - Lord 102 PH 10

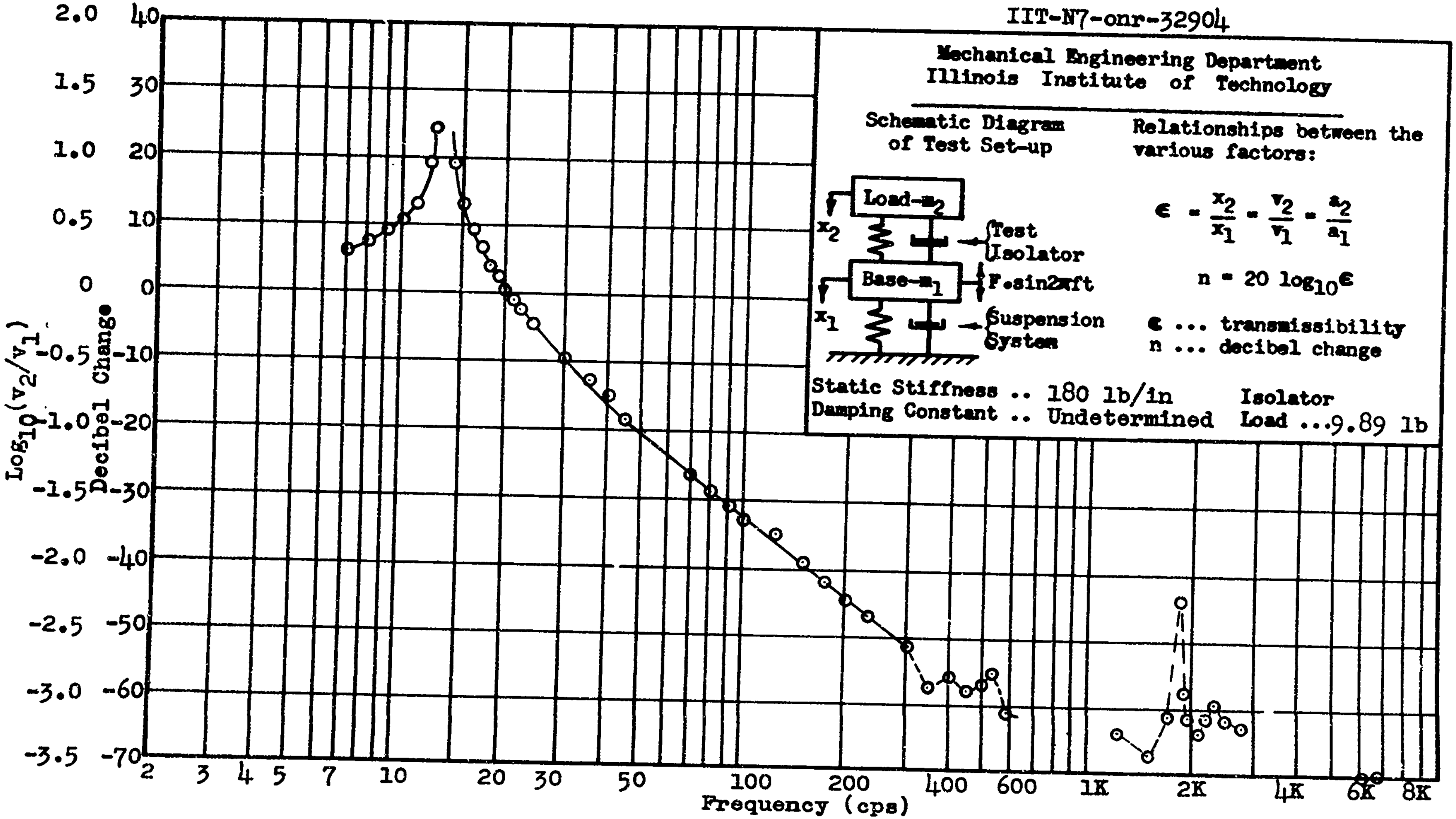
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Lord 102 PH 10

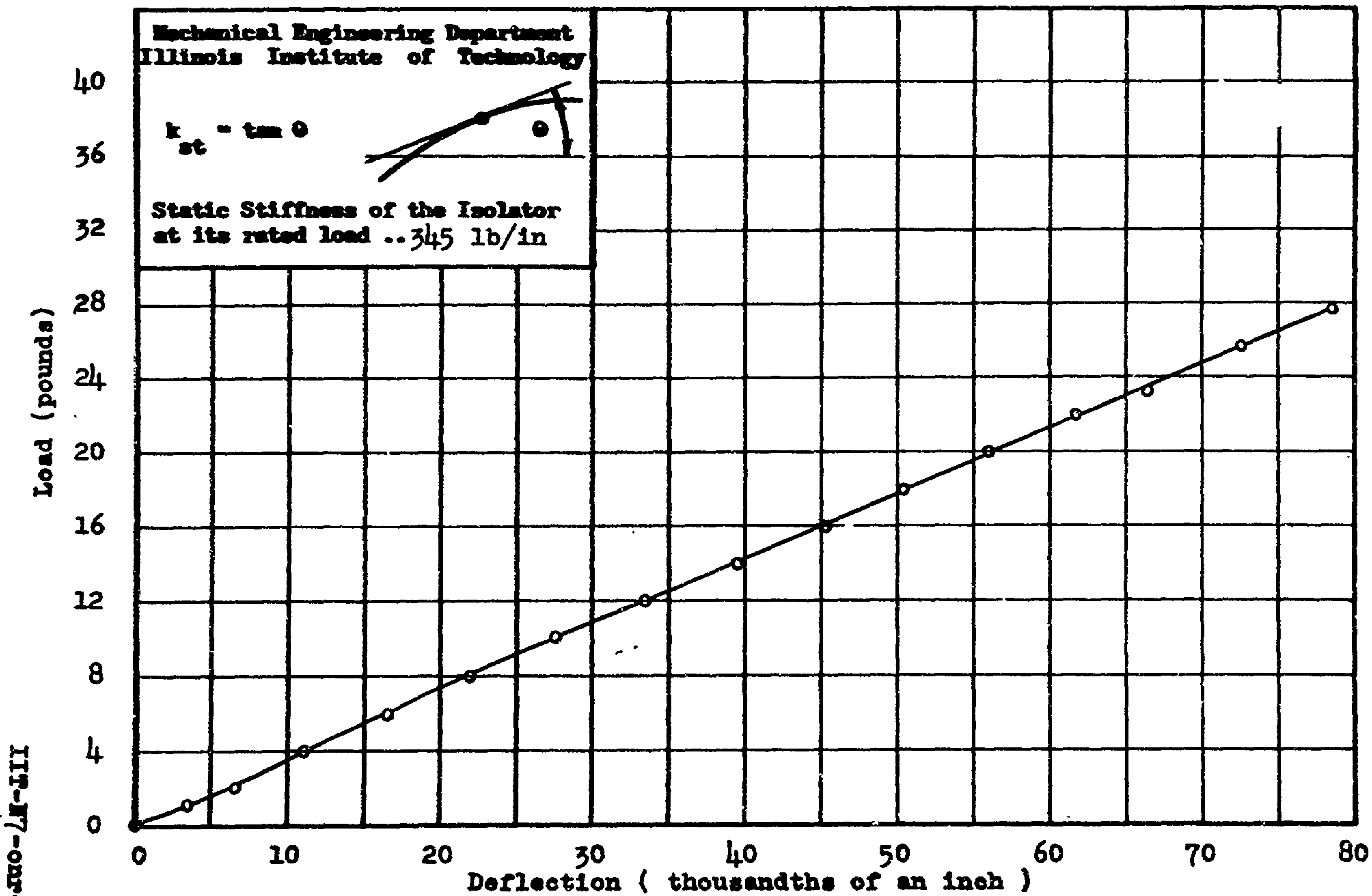
008L-b

IIT-N7-onr-32904



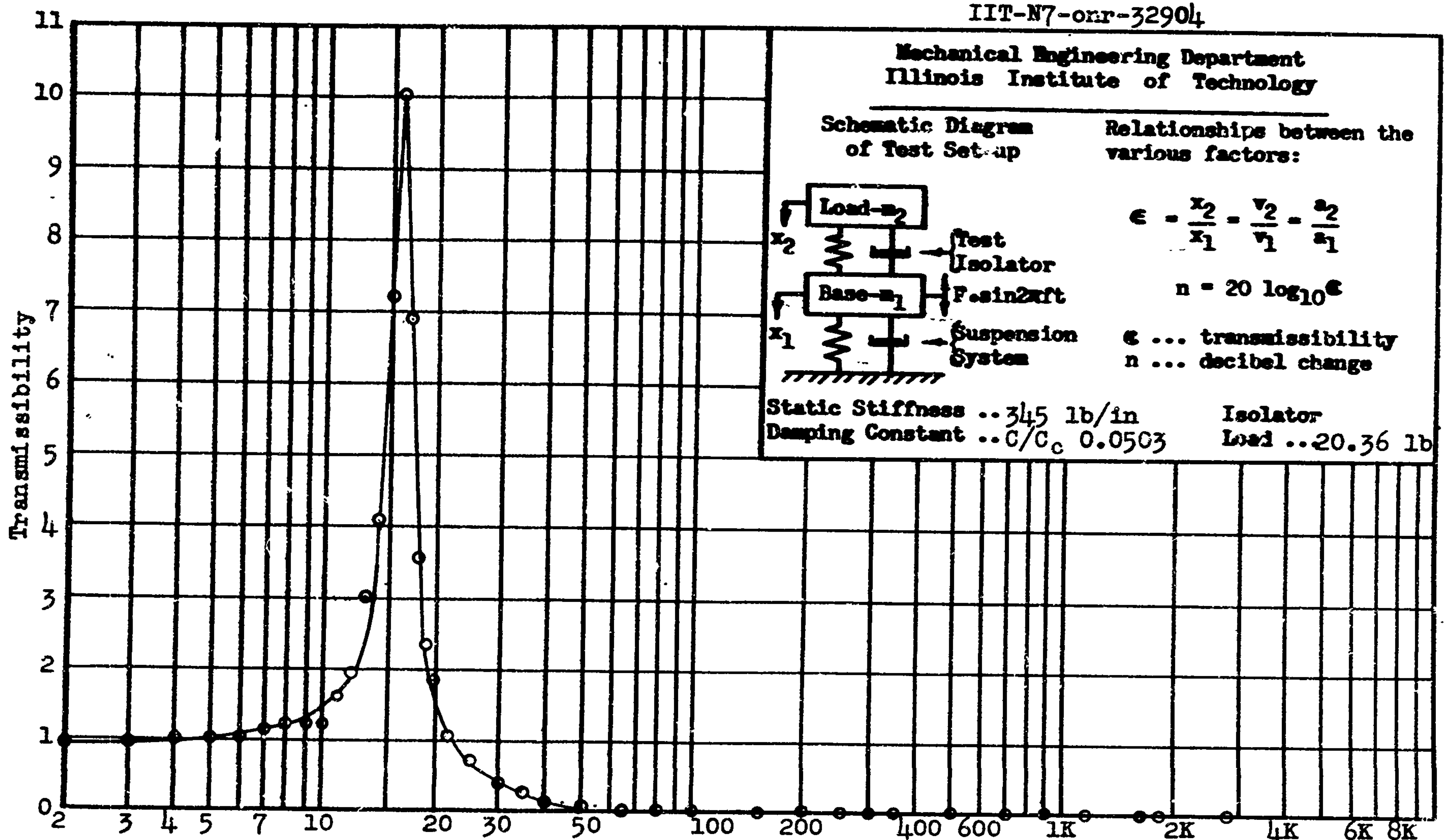
$\log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 102 PH 10

c-T800



Load-Deflection Curve - Barry 104-20

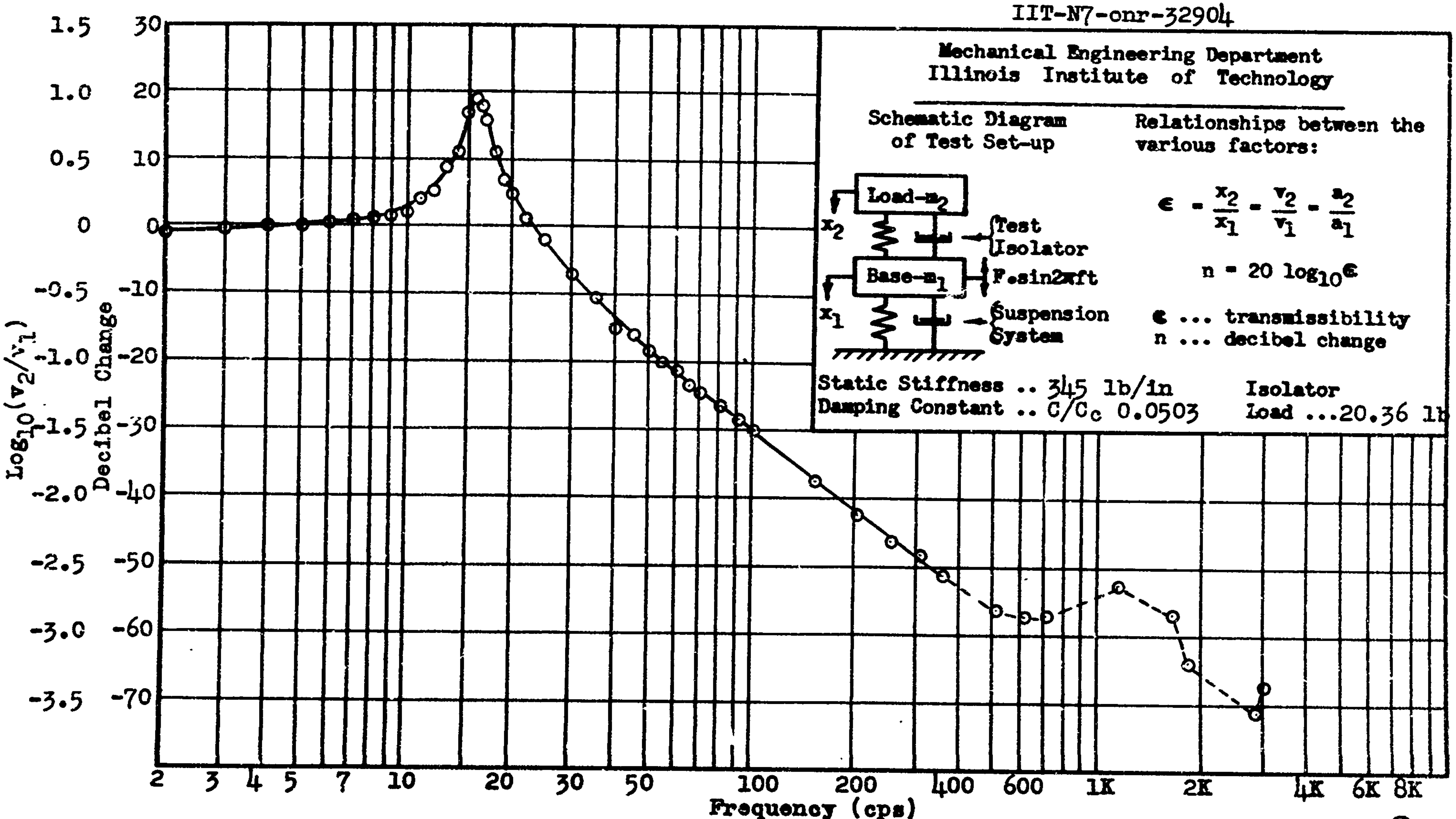
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Barry 104-20

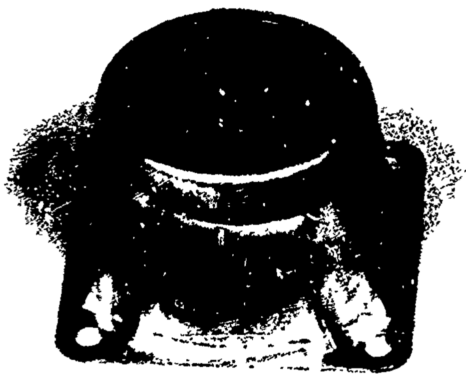
009B-b

IIT-N7-onr-32904



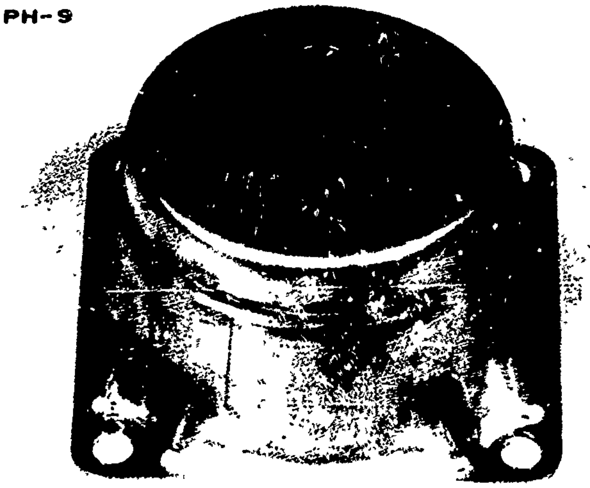
$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Barry 104-20

009B-c

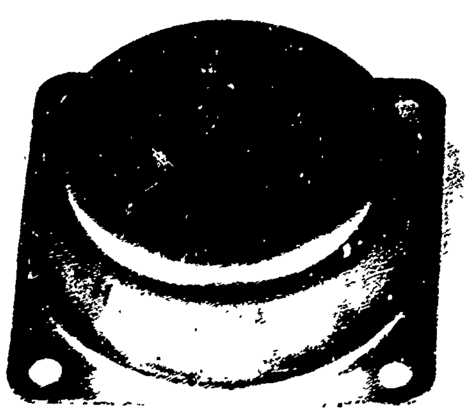


LORD 156PH-9
012 L

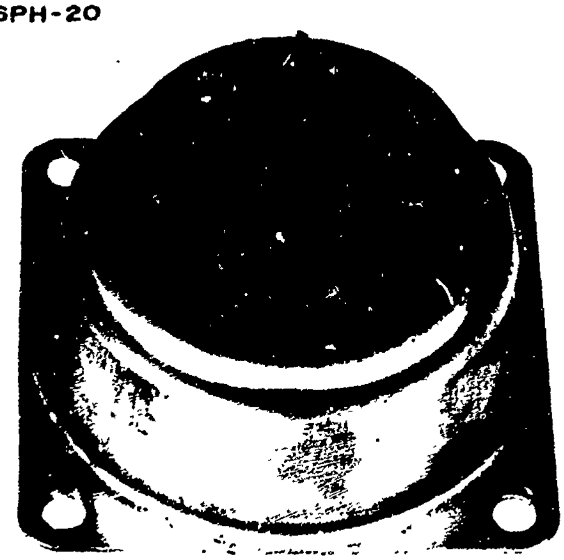
MB 1732.6
032M



LORD 206PH-20
033 L

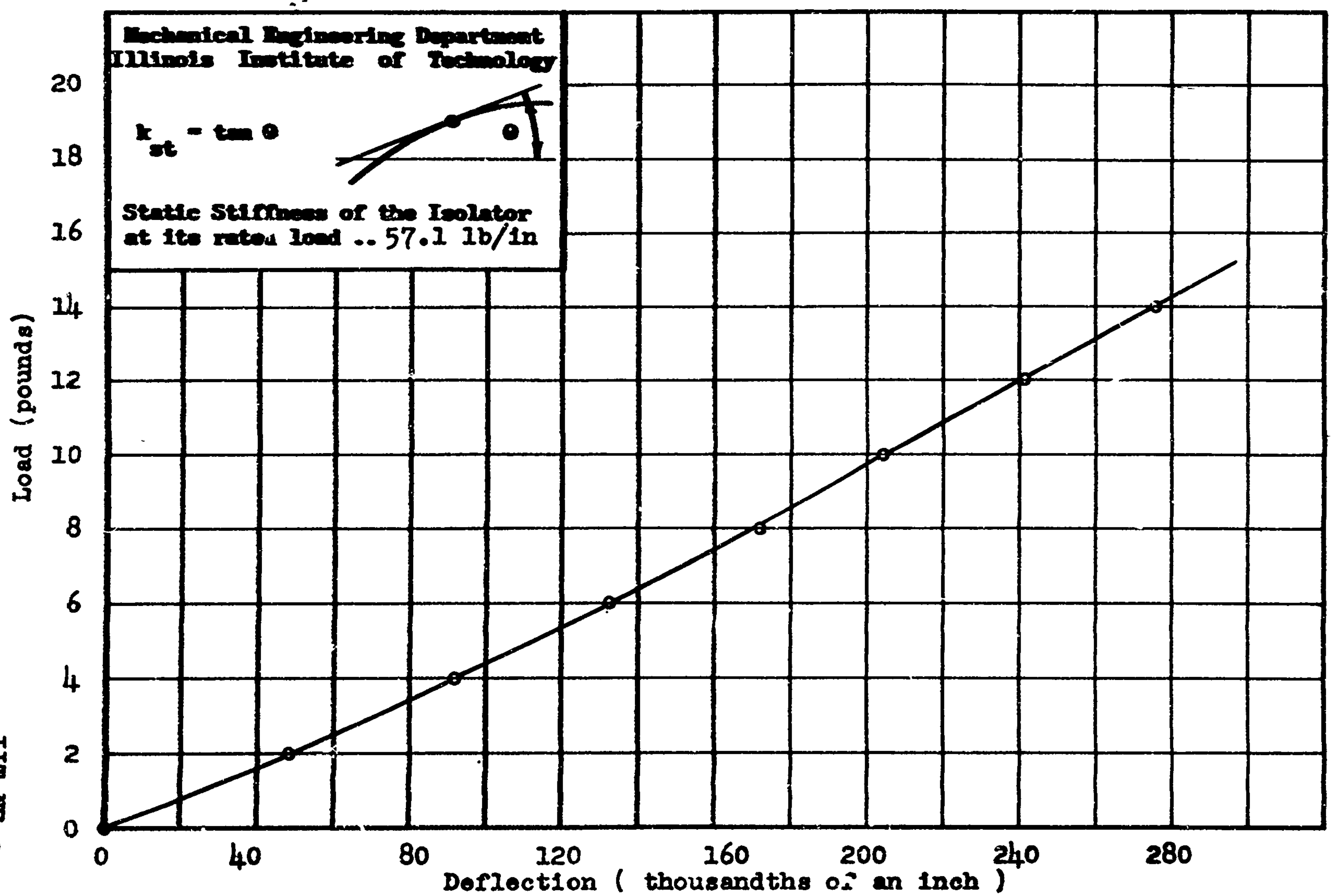


LORD 153PH-20
034 L



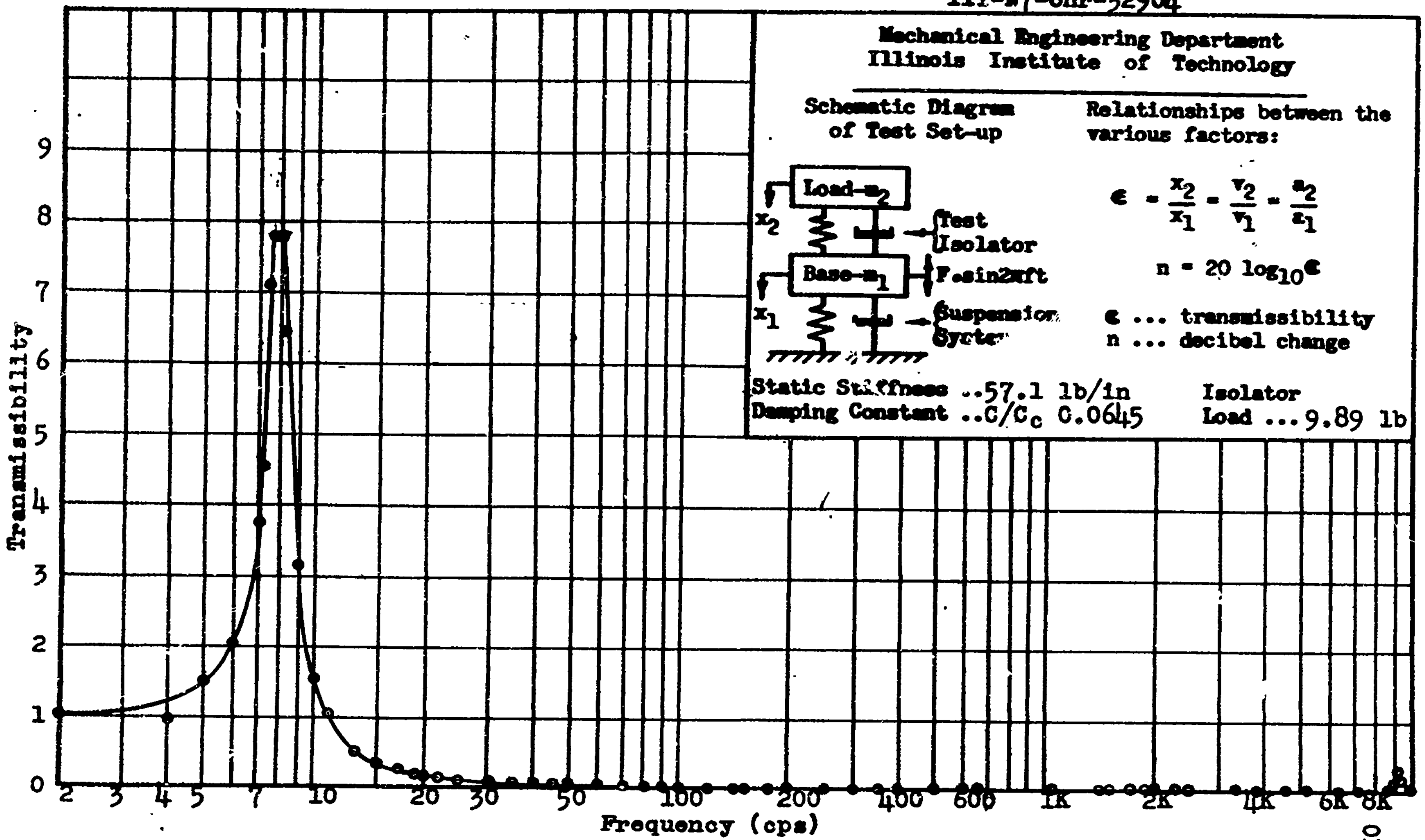
LORD 204PH-20
035 L

PLATE VI-3



Load-Deflection Curve - Lord 156 PH 9

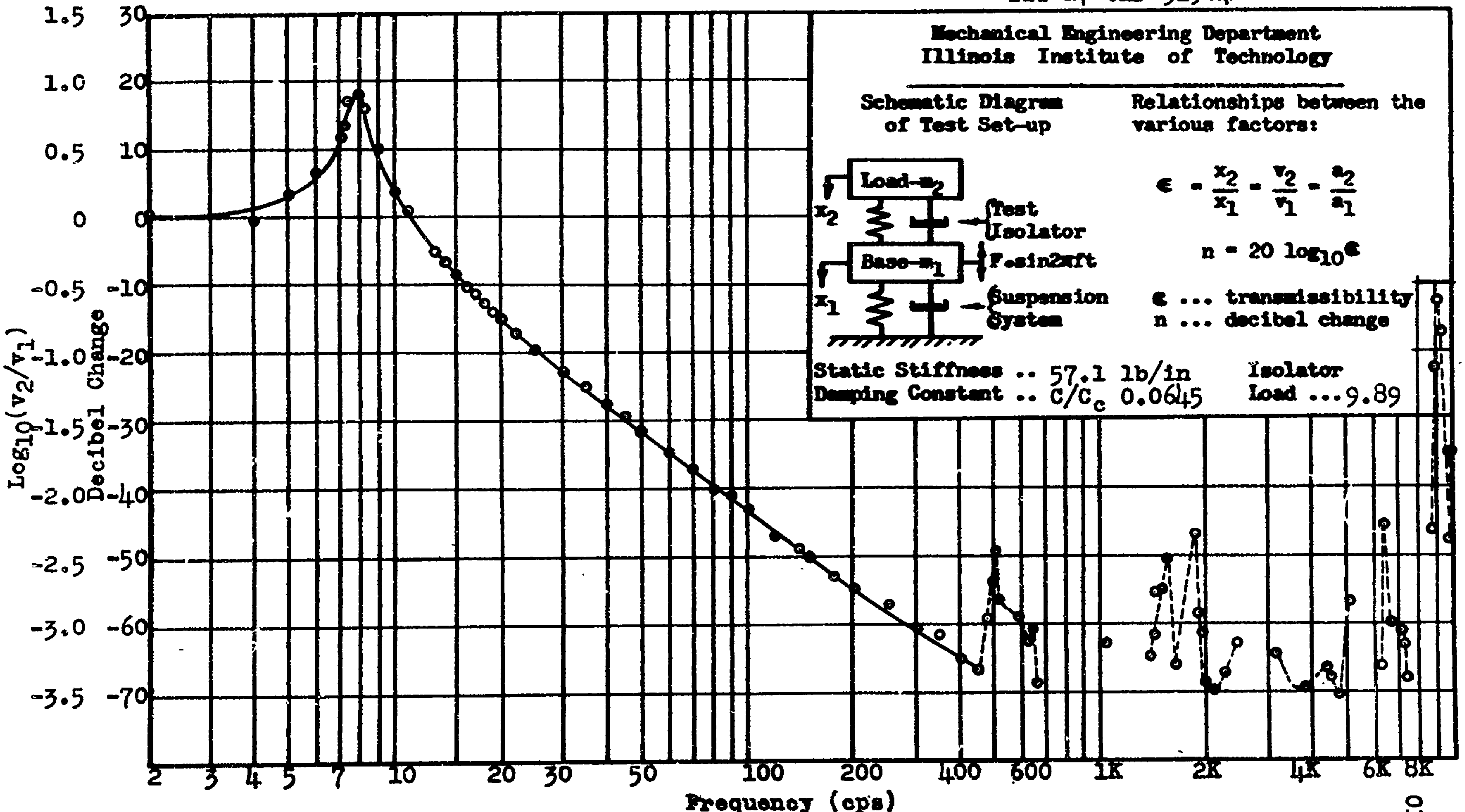
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Lord 156 PH 9

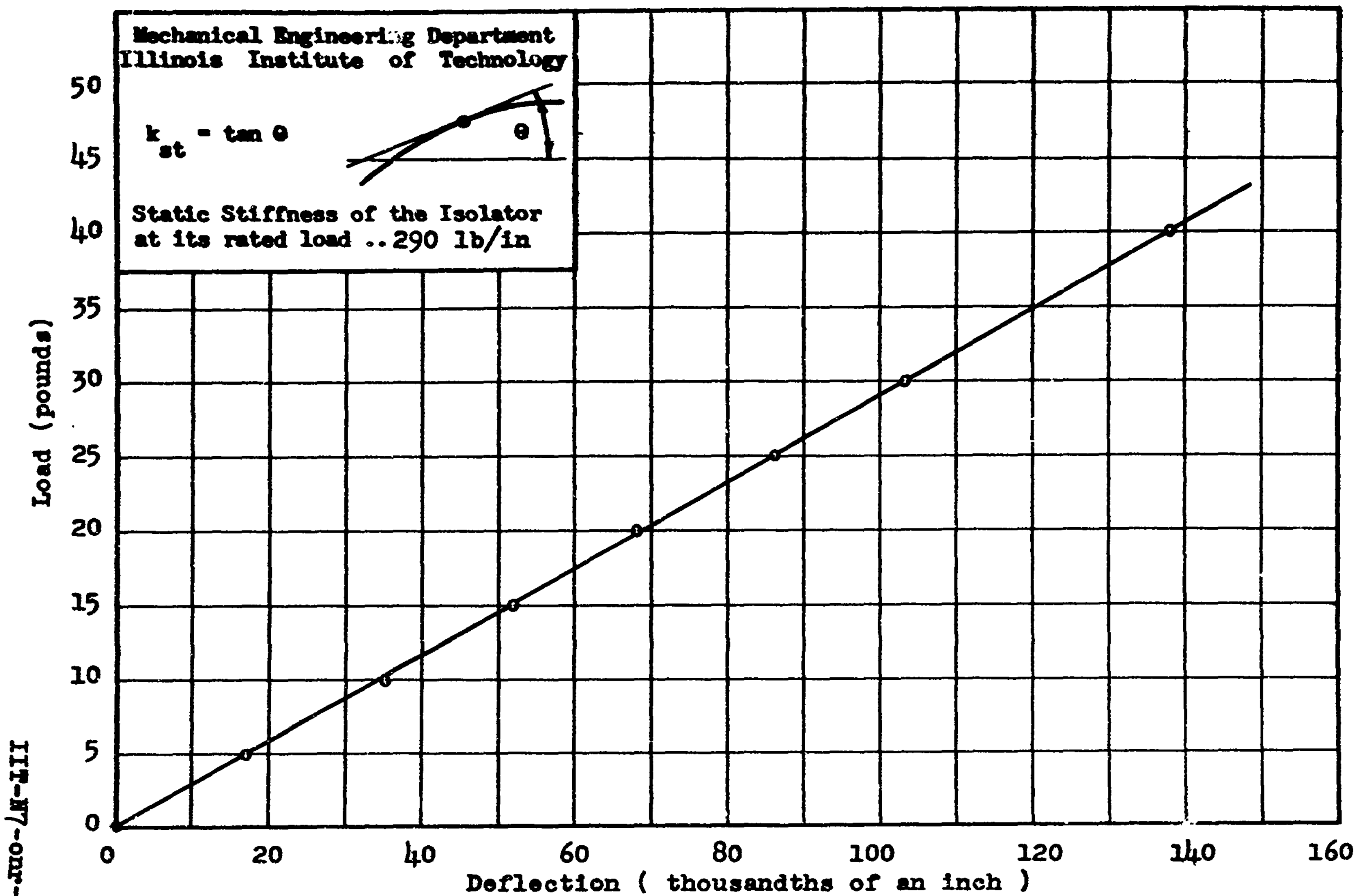
012L-b

IIT-N7-onr-32904



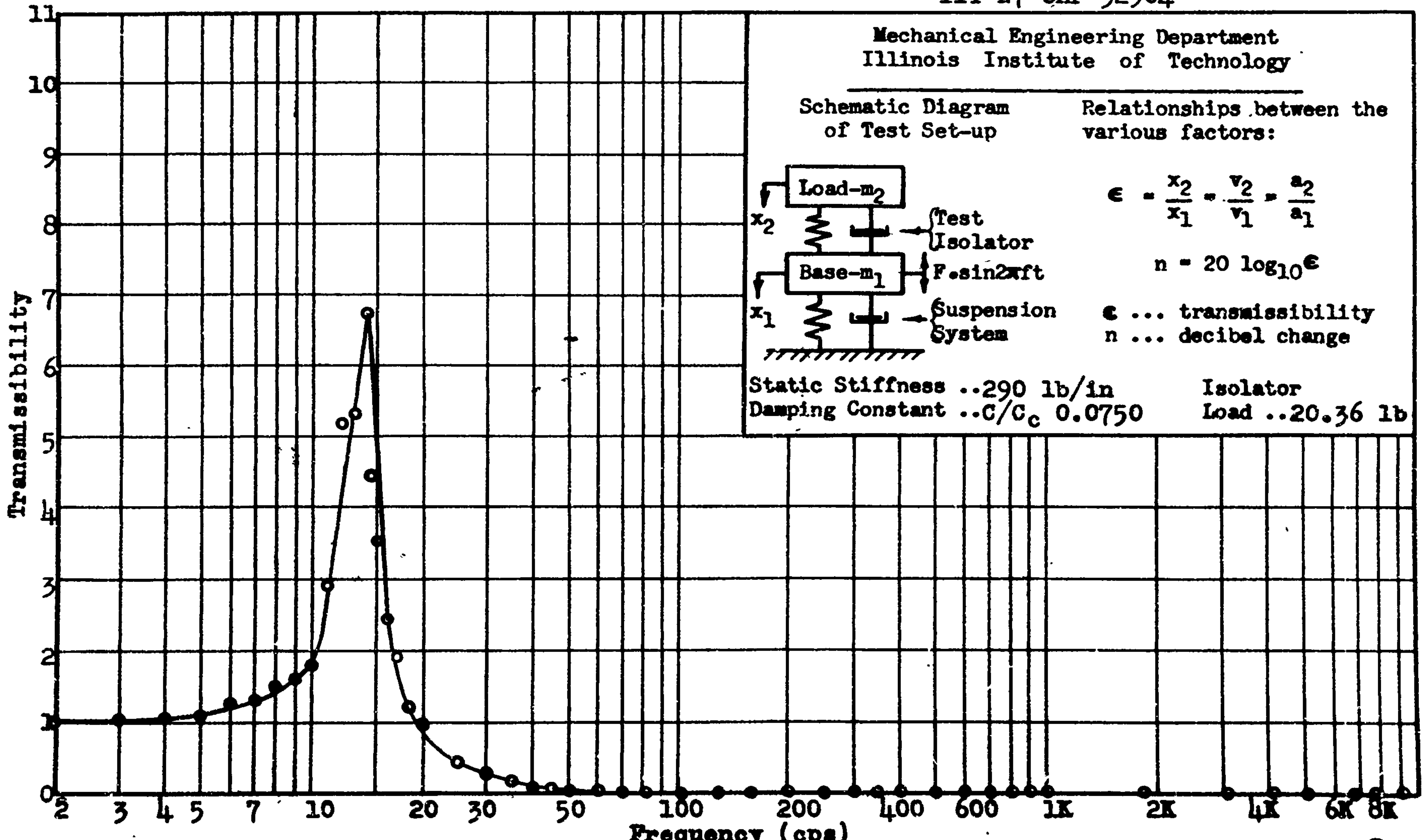
$\log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 156 PH 9

012L-c



Load-Deflection Curve - MB 1732.6

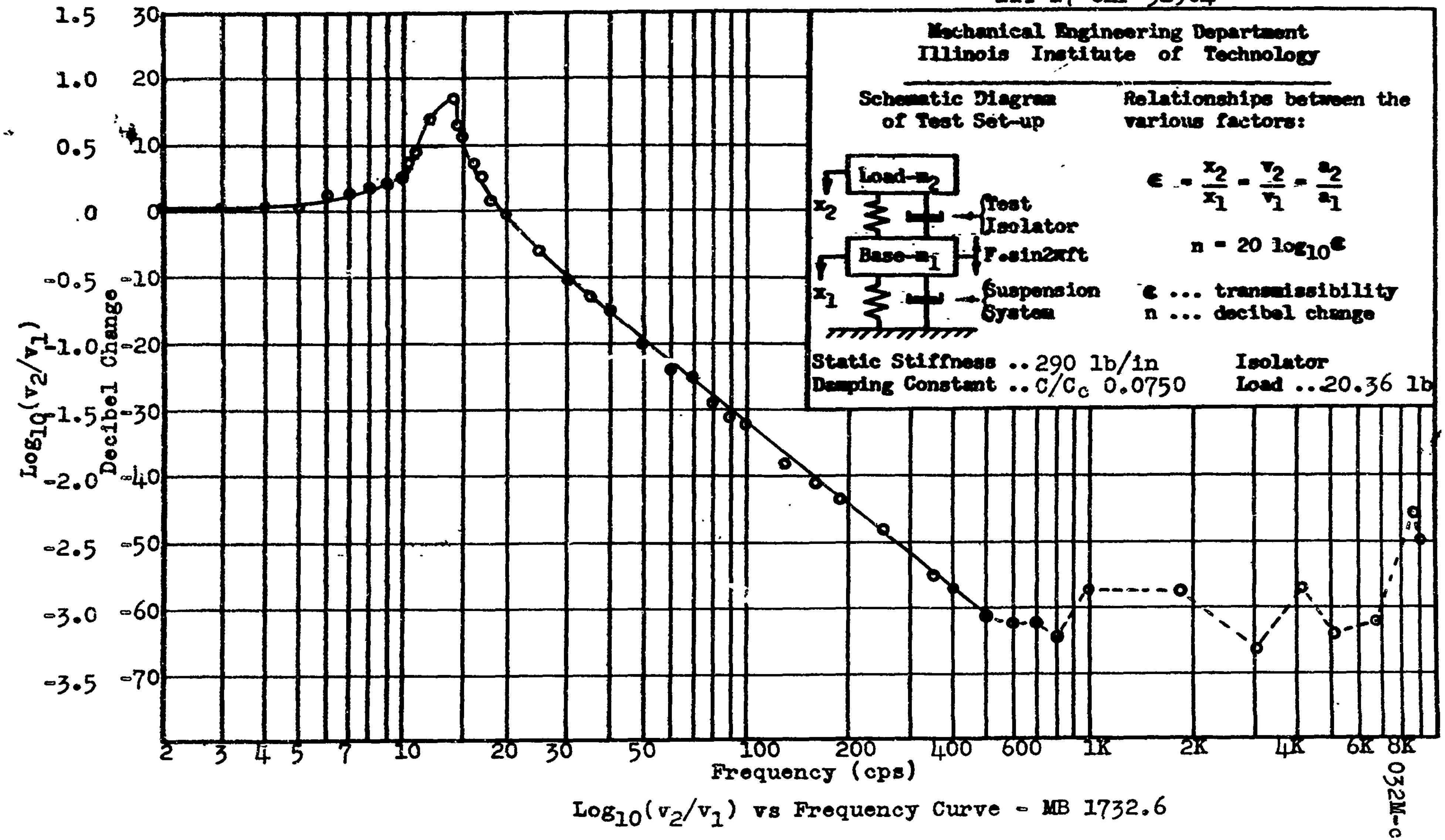
IIT-N7-onr-32904



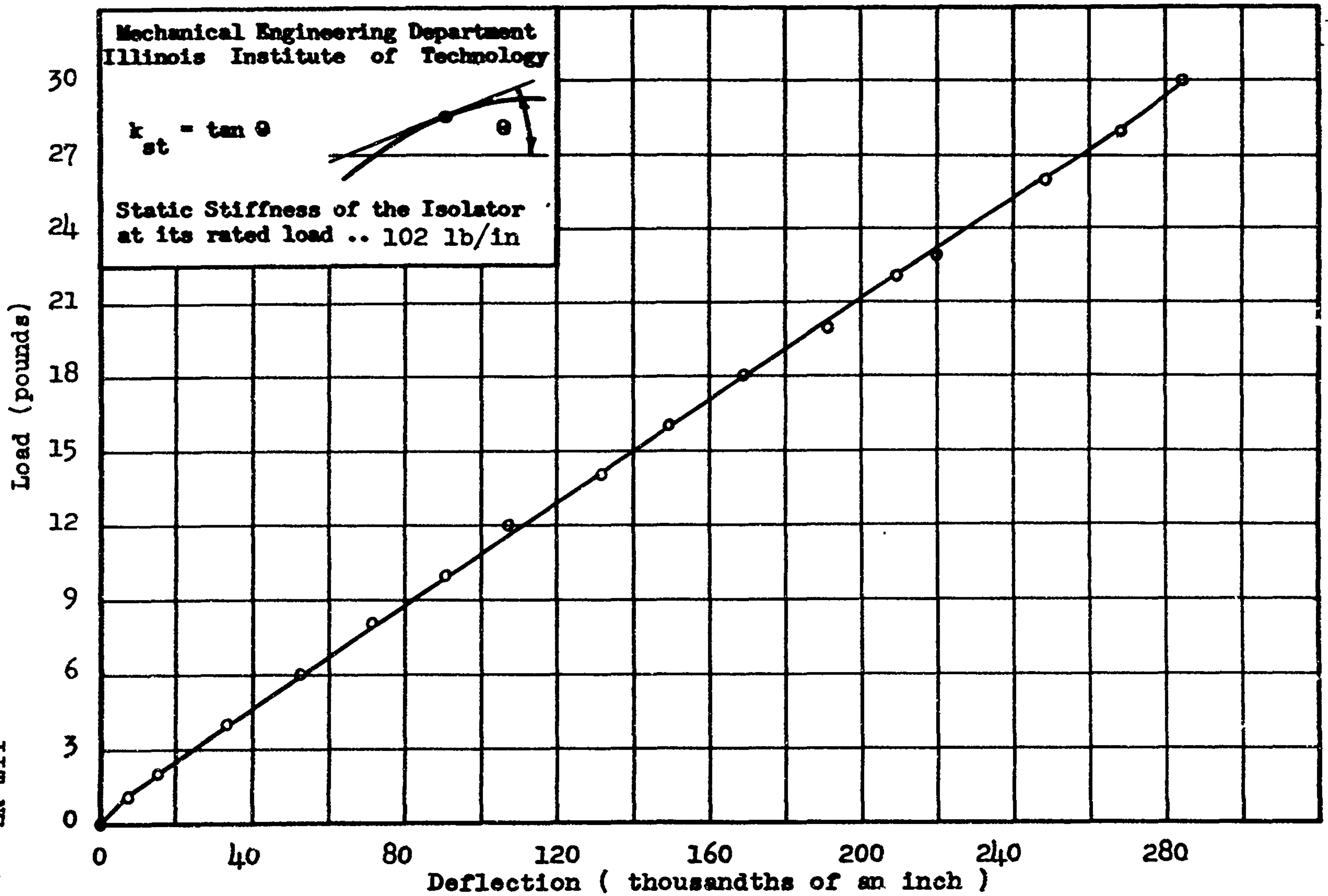
Transmissibility vs Frequency Curve - MB 1732.6

032M-b

IIT-N7-onr-32904

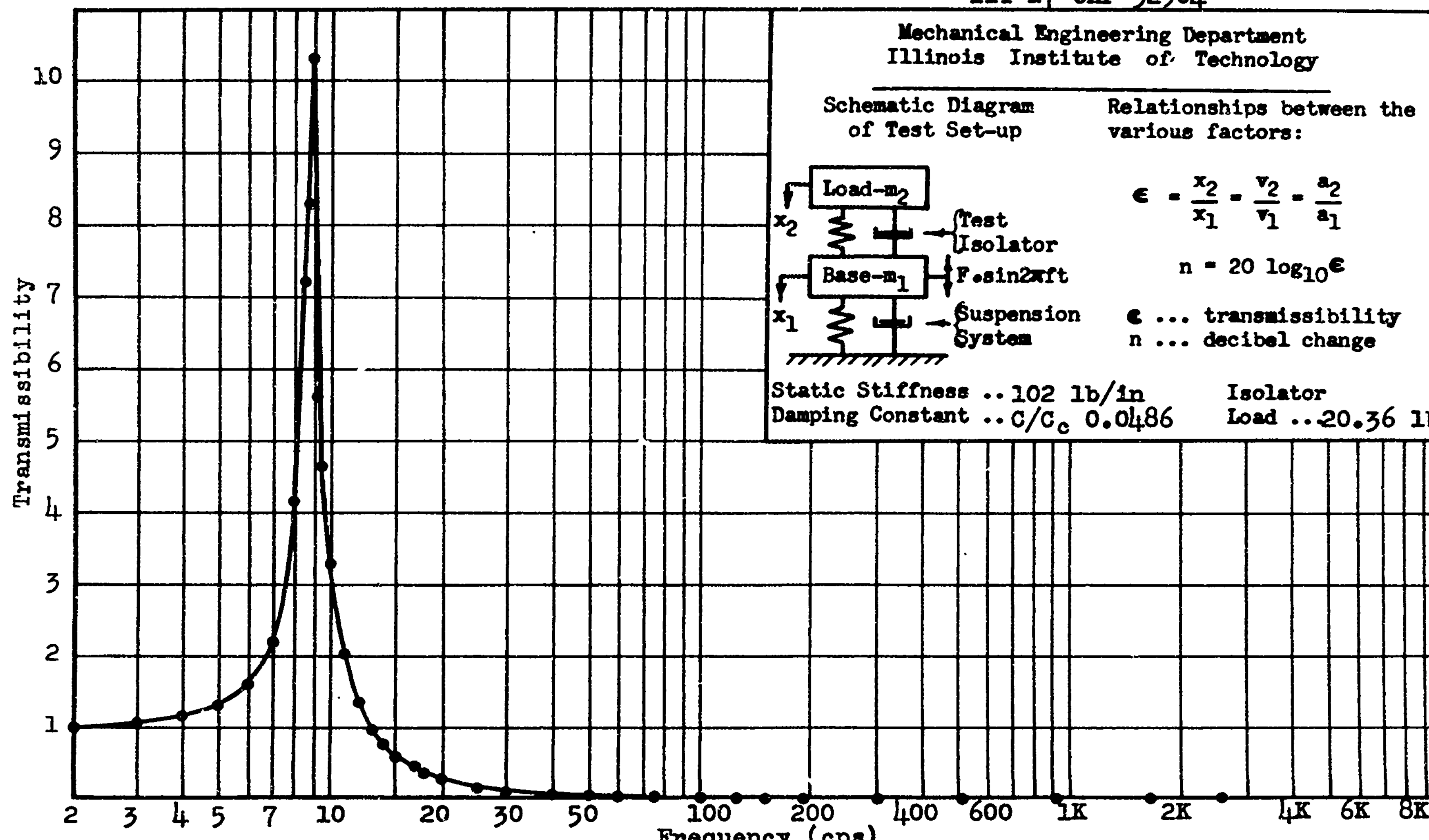


$Log_{10}(v_2/v_1)$ vs Frequency Curve - MB 1732.6



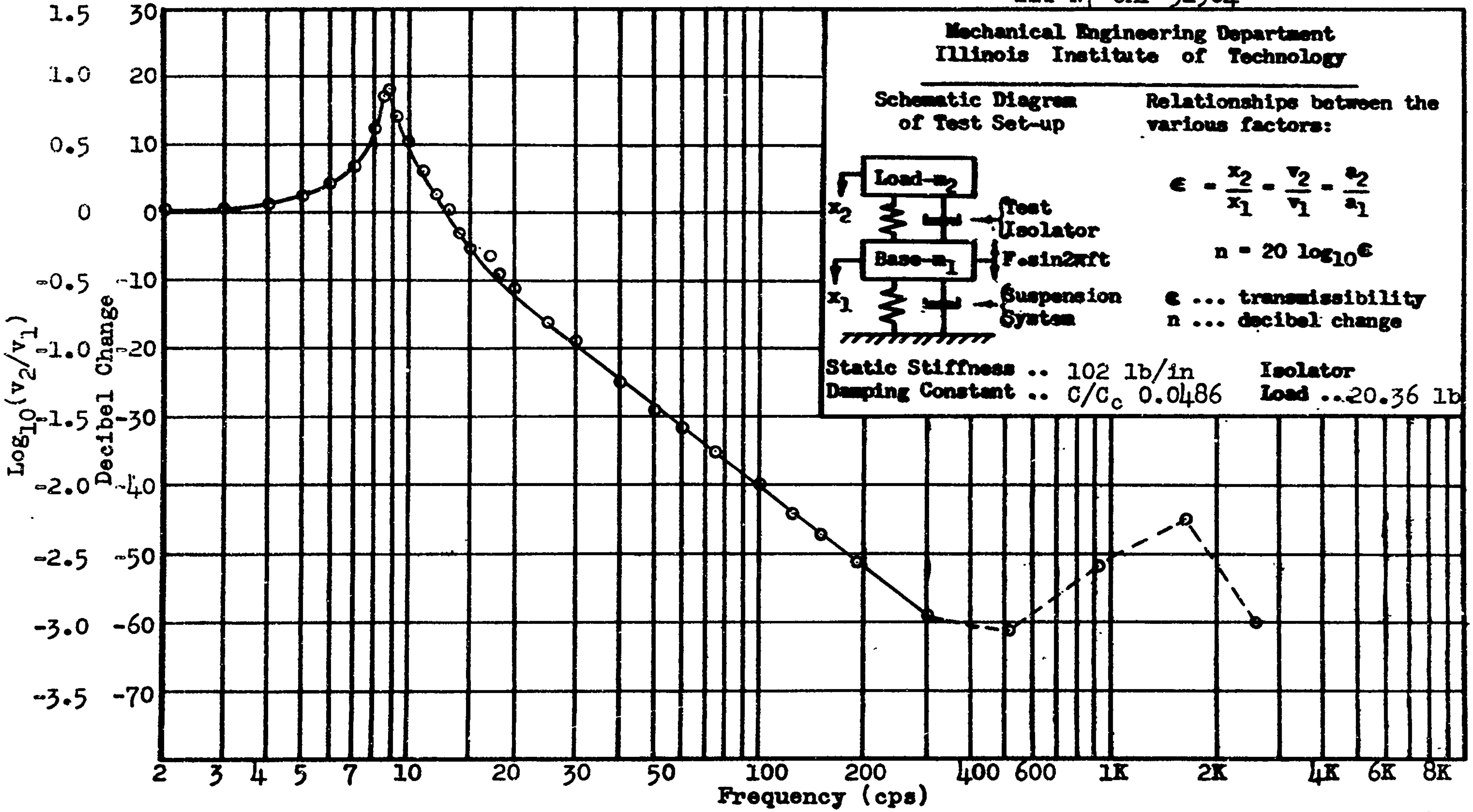
Load-Deflection Curve - Lord 206 PH 20

IIT-N7-onr-32904



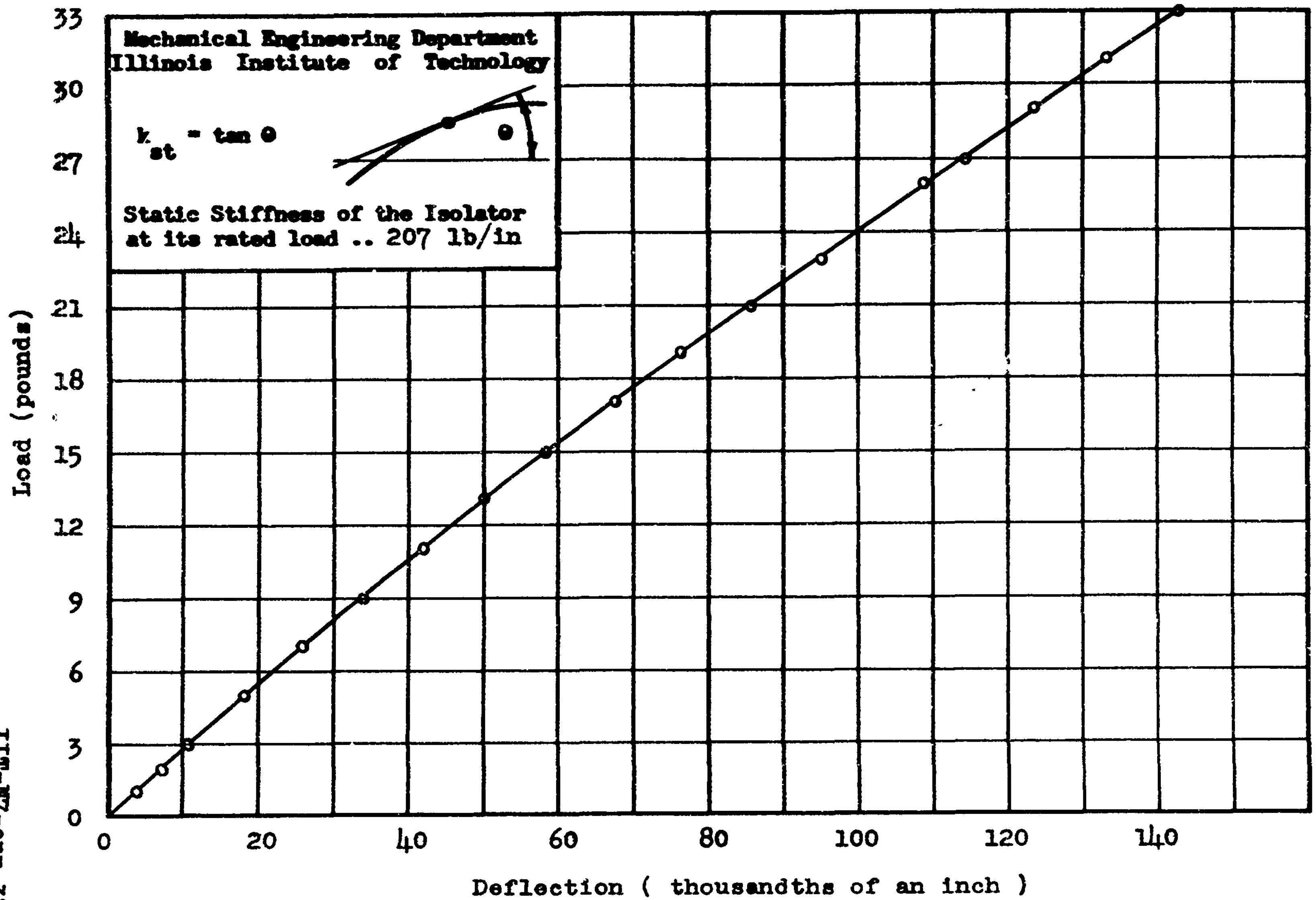
Transmissibility vs Frequency Curve - Lord 206 PH 20

033L-b



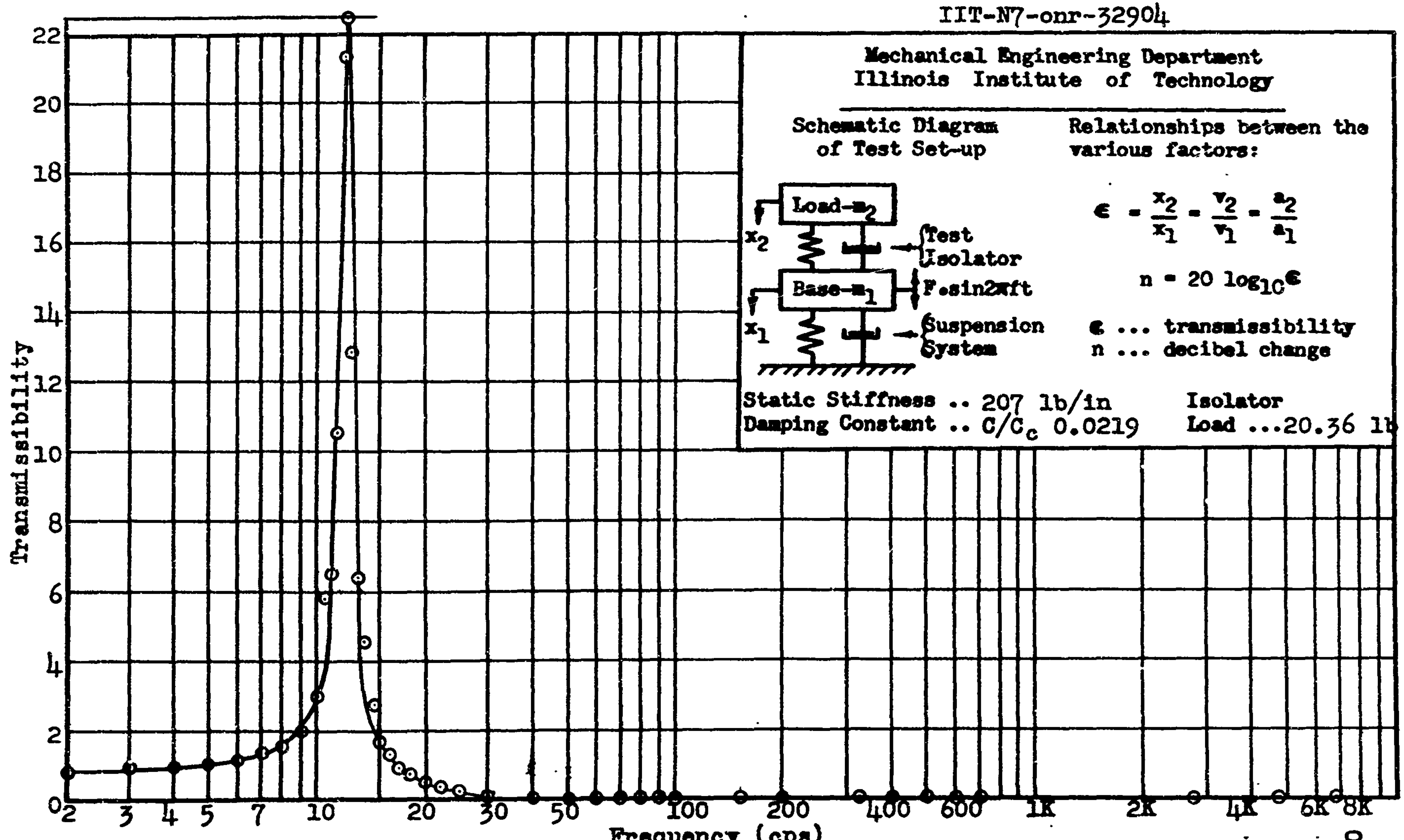
$\mathrm{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 206 PH 20

033L-c



Load-Deflection Curve - Lord 153 PH 20

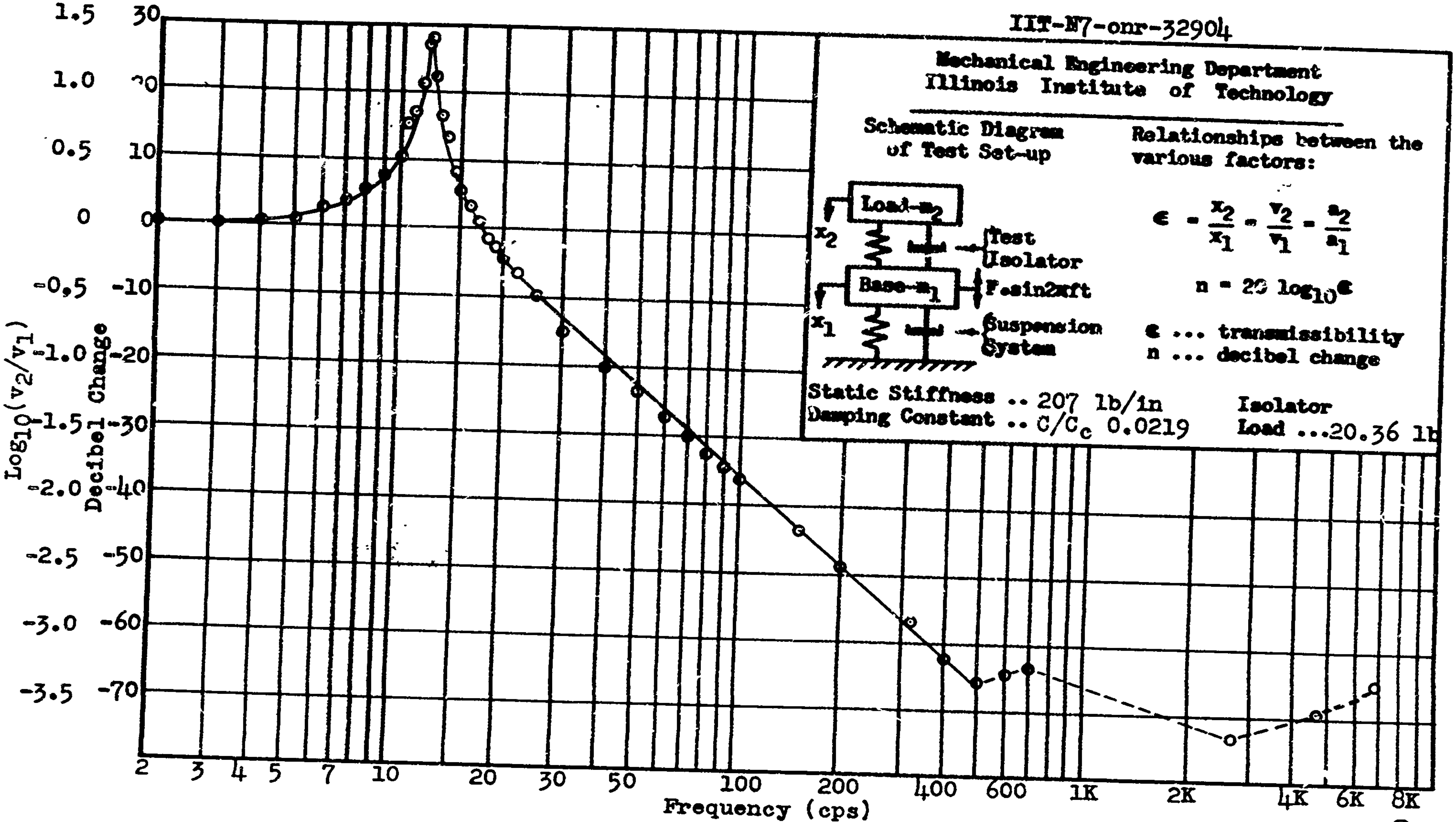
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Lord 153 PH 20

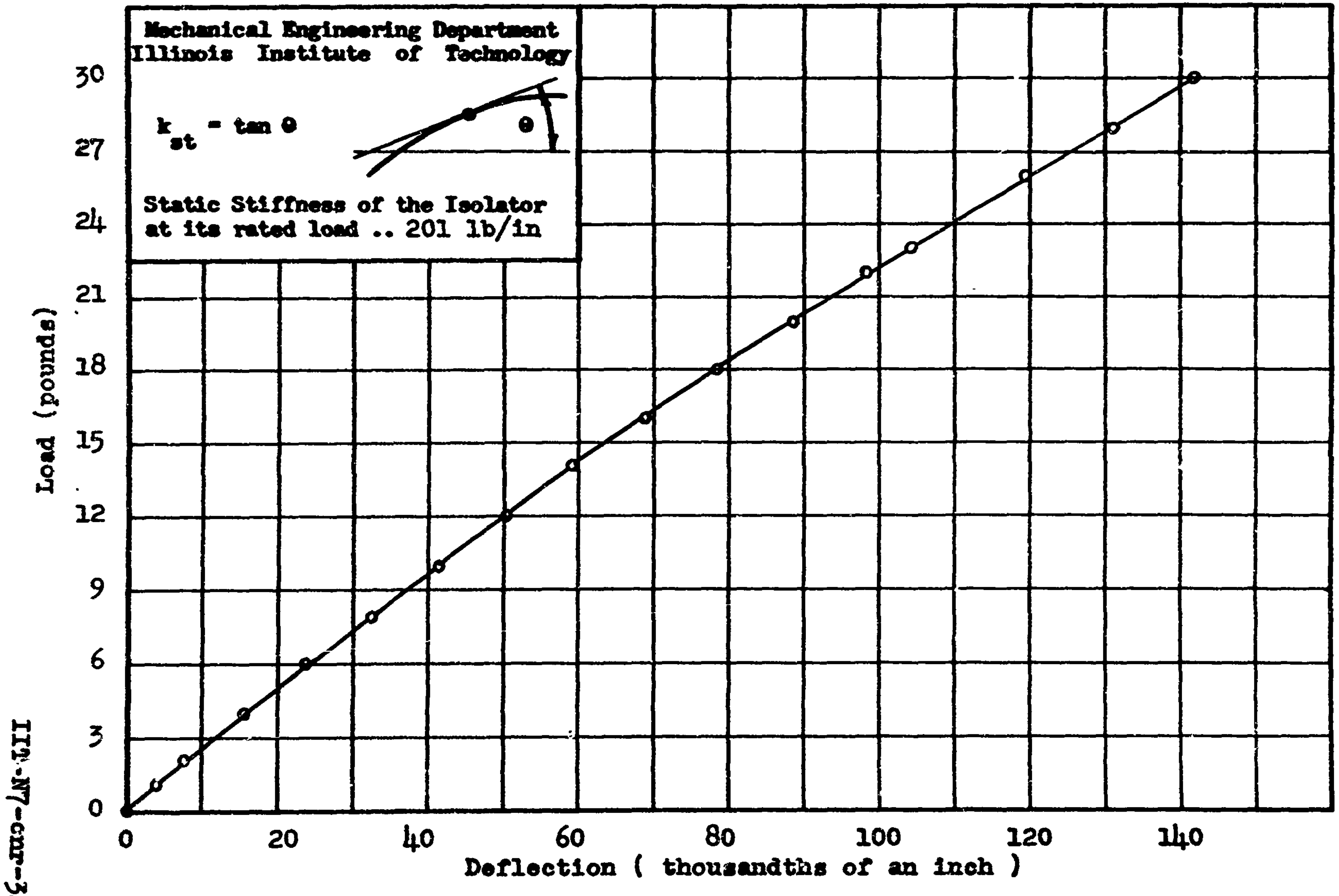
034L-b

IIT-N7-onr-32904

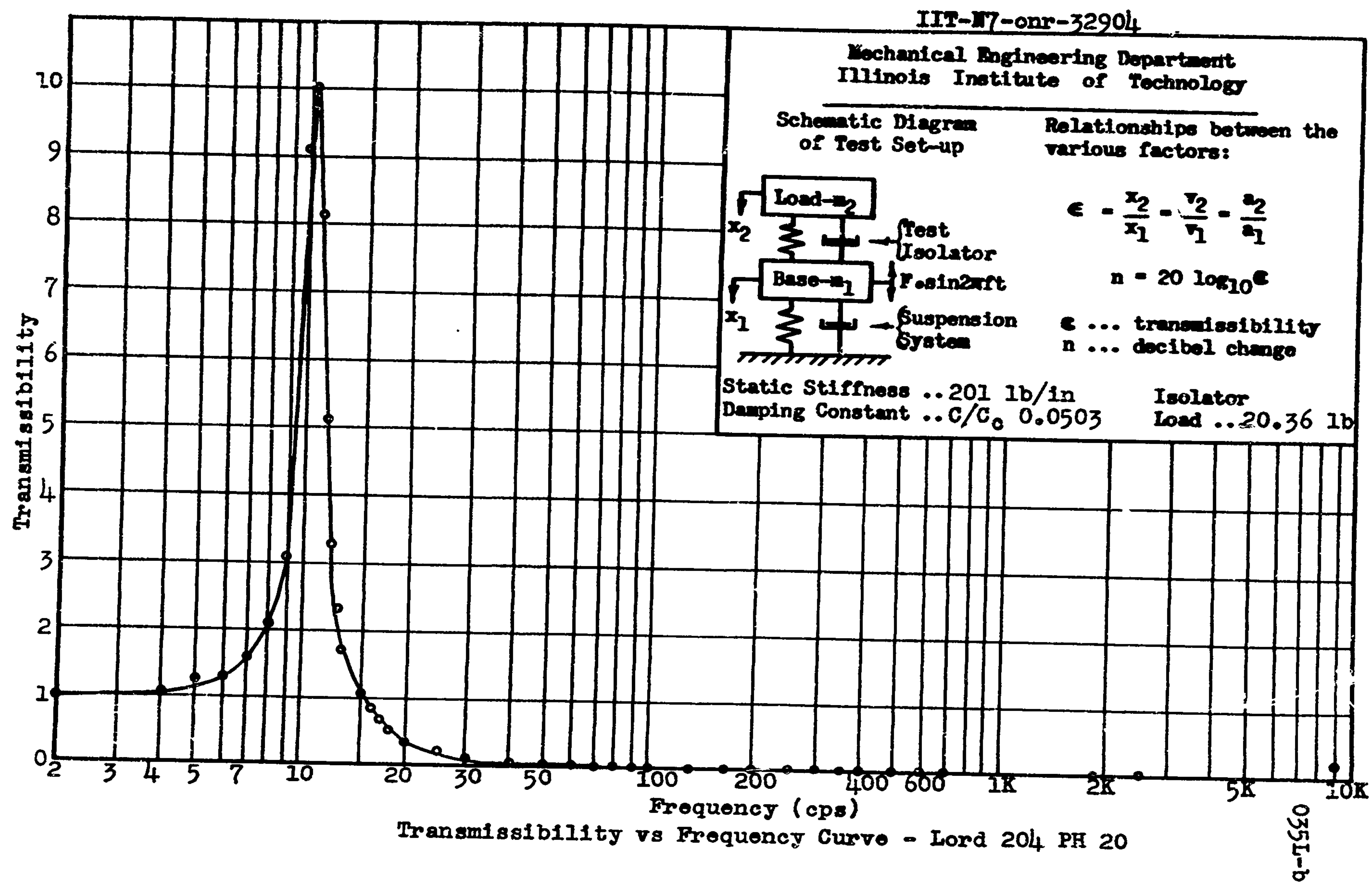


$Log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 153 PH 20

03-T-H-

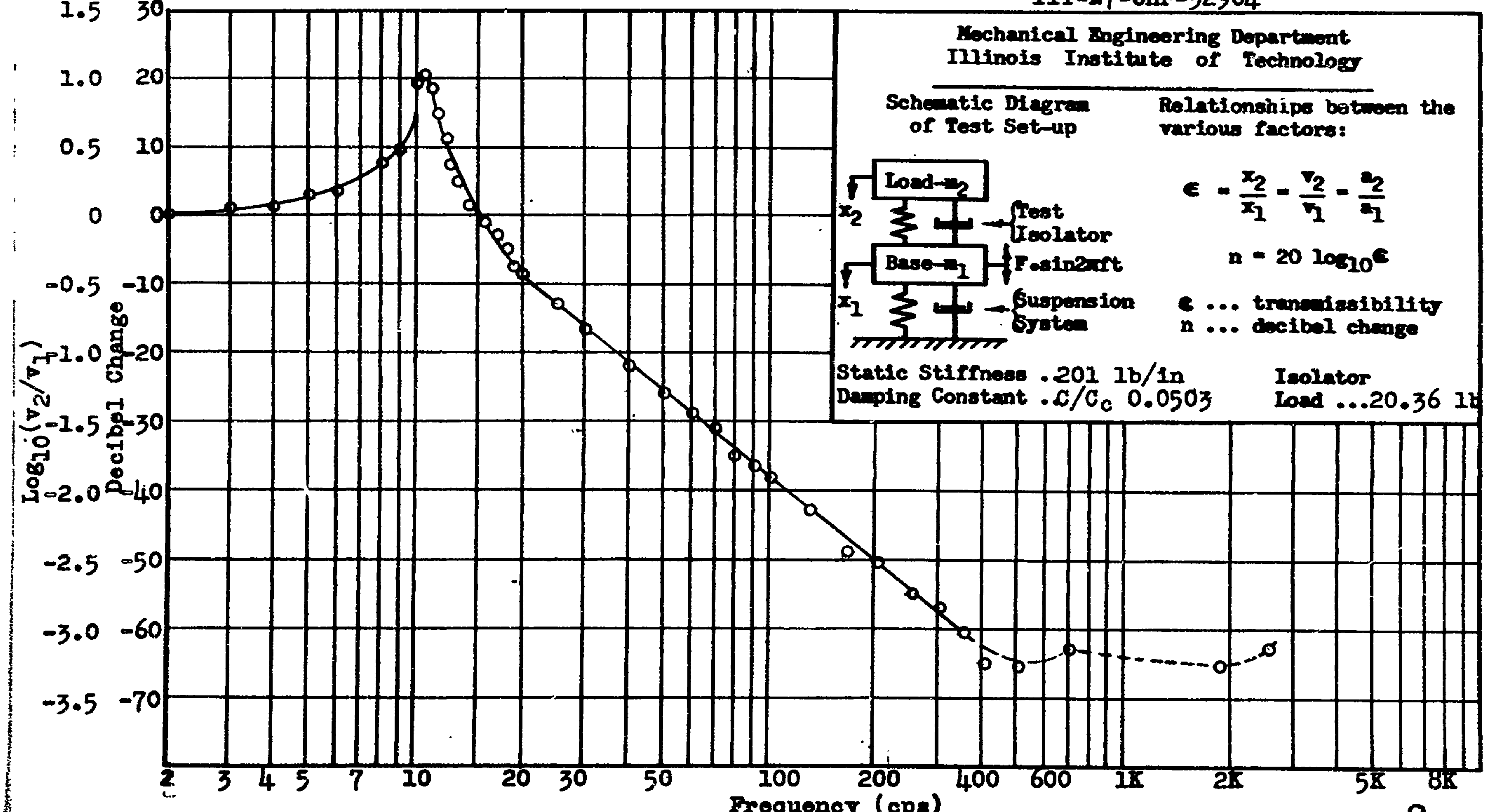


Load-Deflection Curve - Lord 204 PH 20



Transmissibility vs Frequency Curve - Lord 204 PH 20

IIT-N7-onr-32904



$\log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 204 PH 20

035L-c

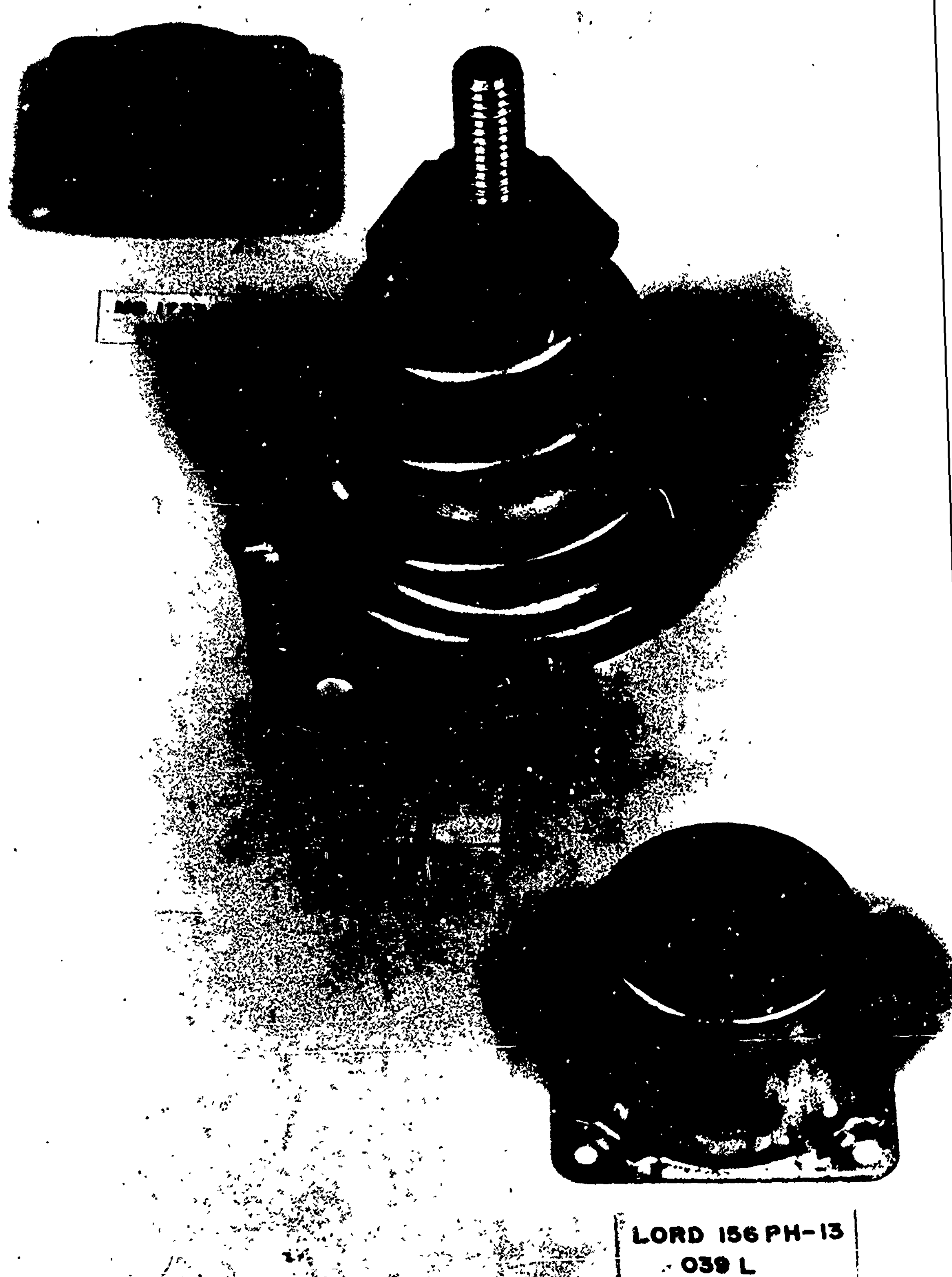
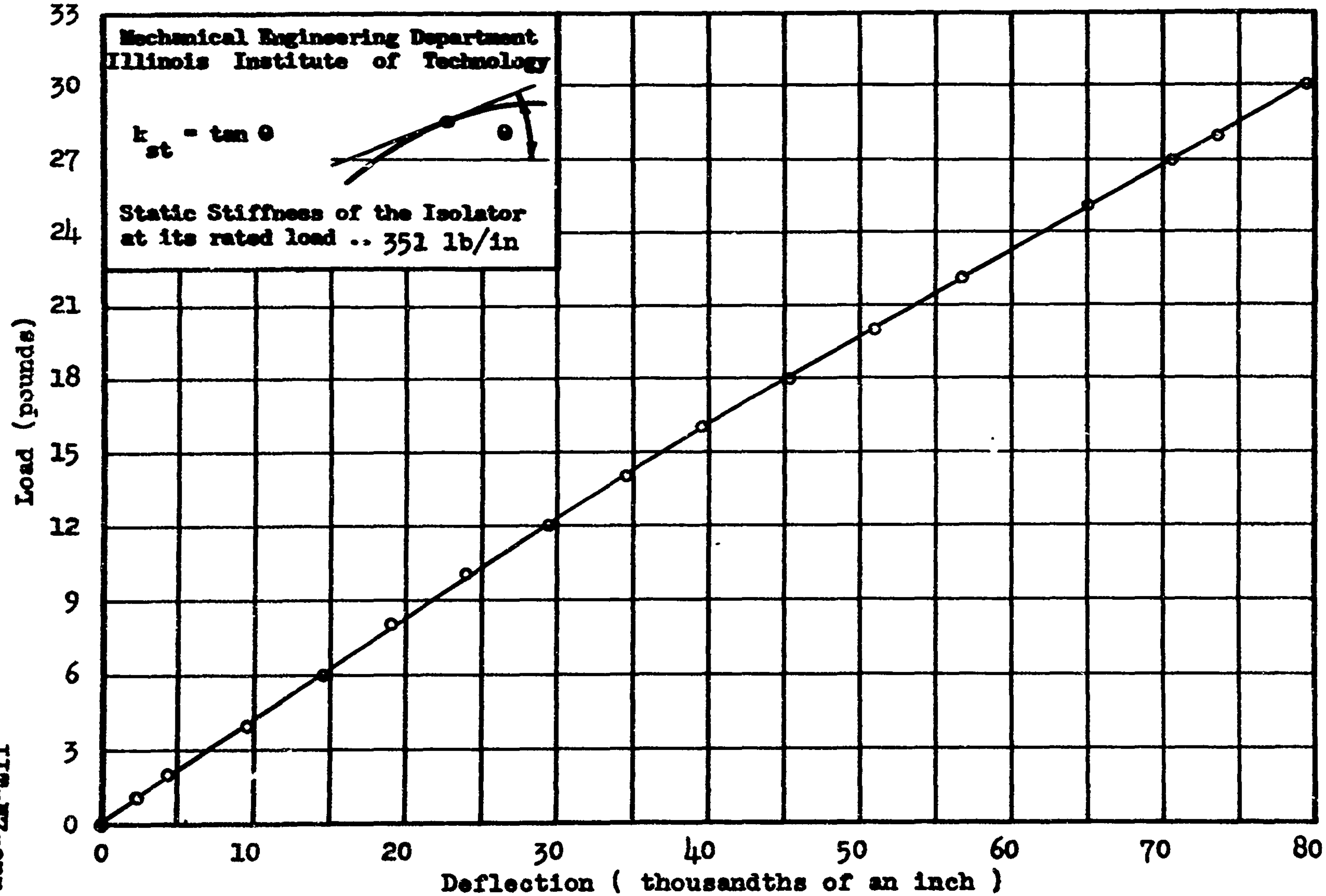
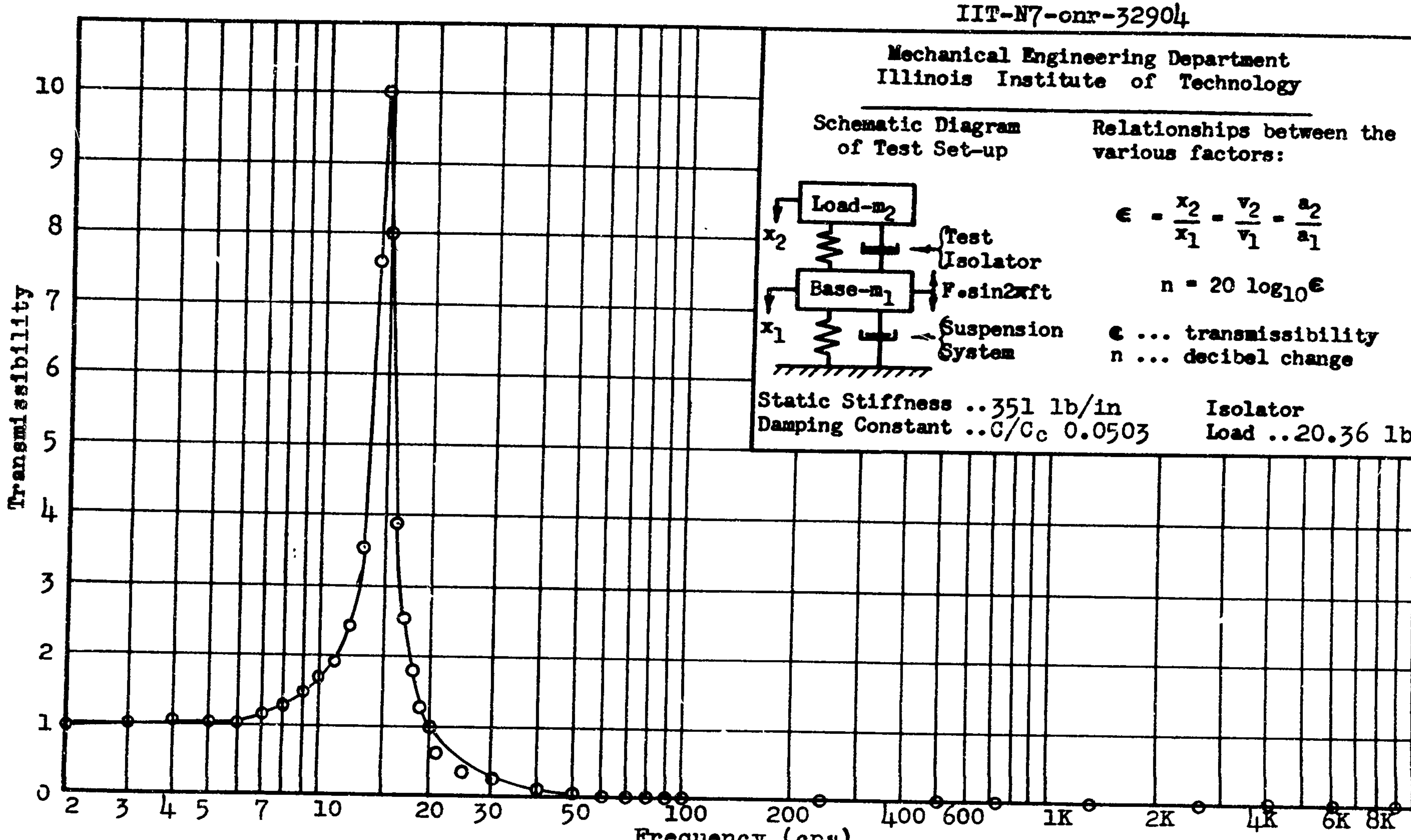


PLATE VI-4



Load-Deflection Curve - MB 1733.2

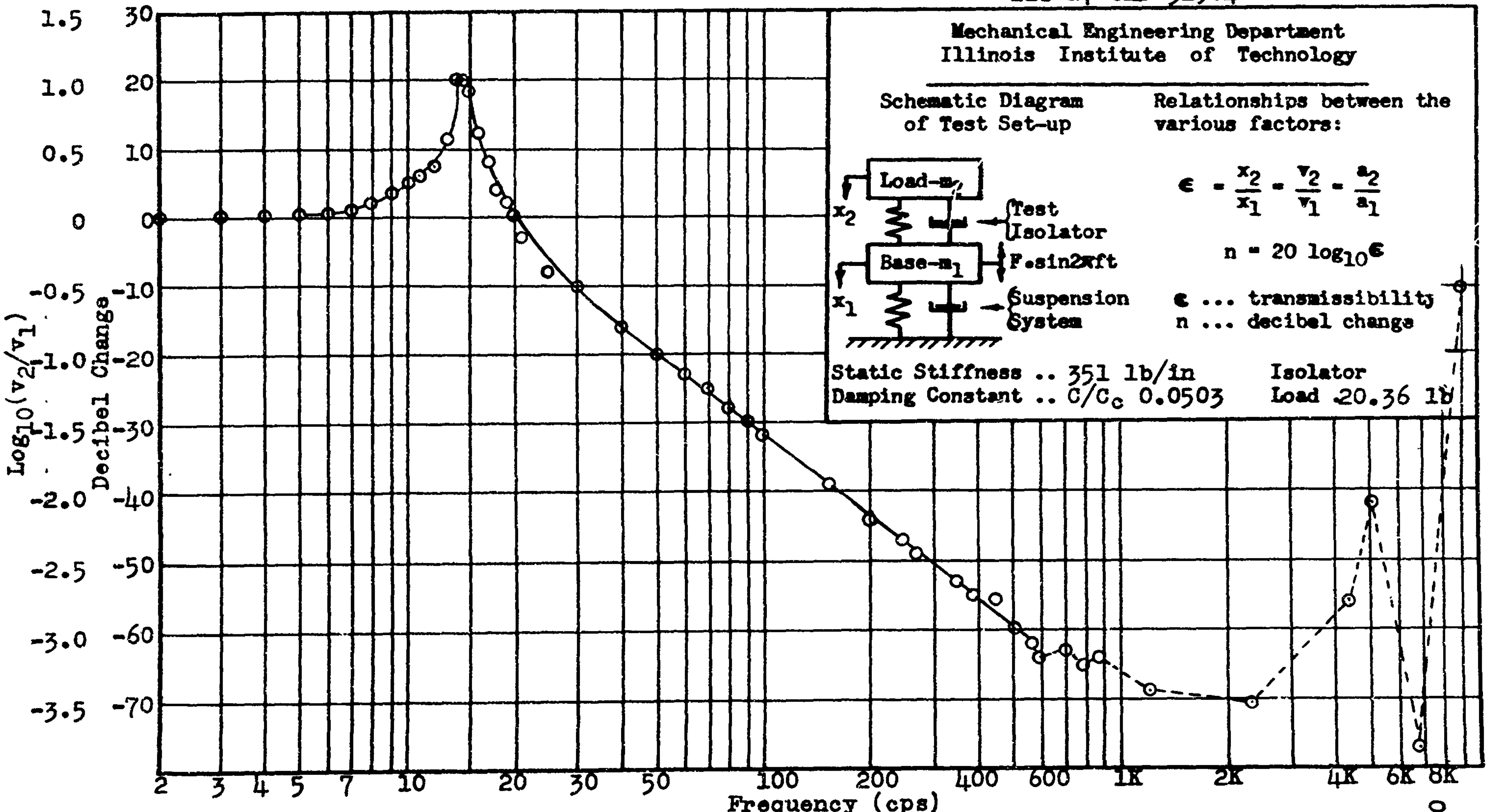
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - MB 1733.2

036M-b

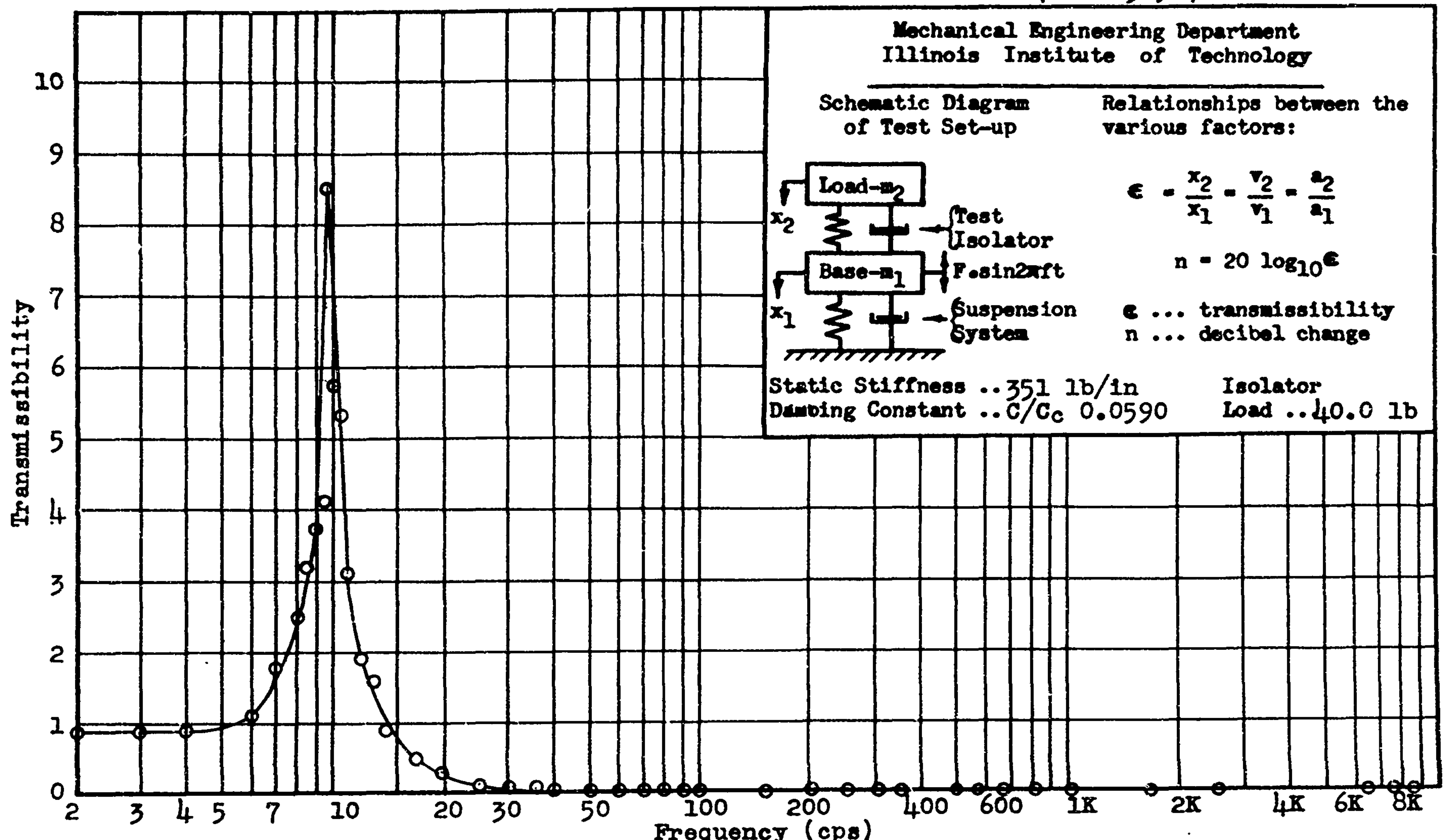
IIT-N7-onr-32904



$\mathrm{Log}_{10}(v_2/v_1)$ vs Frequency Curve - MB 1733.2

036M-c

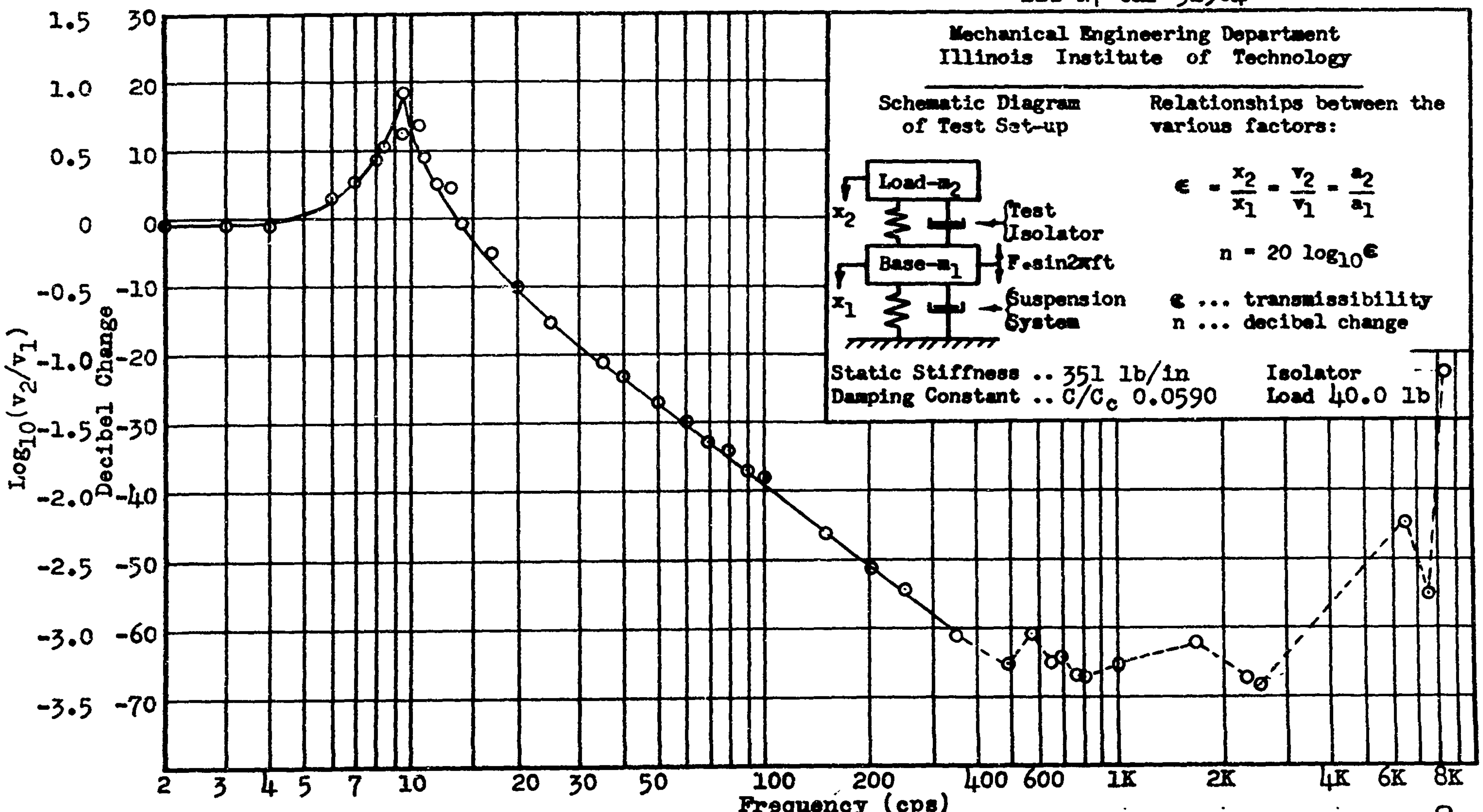
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - MB 1733.2

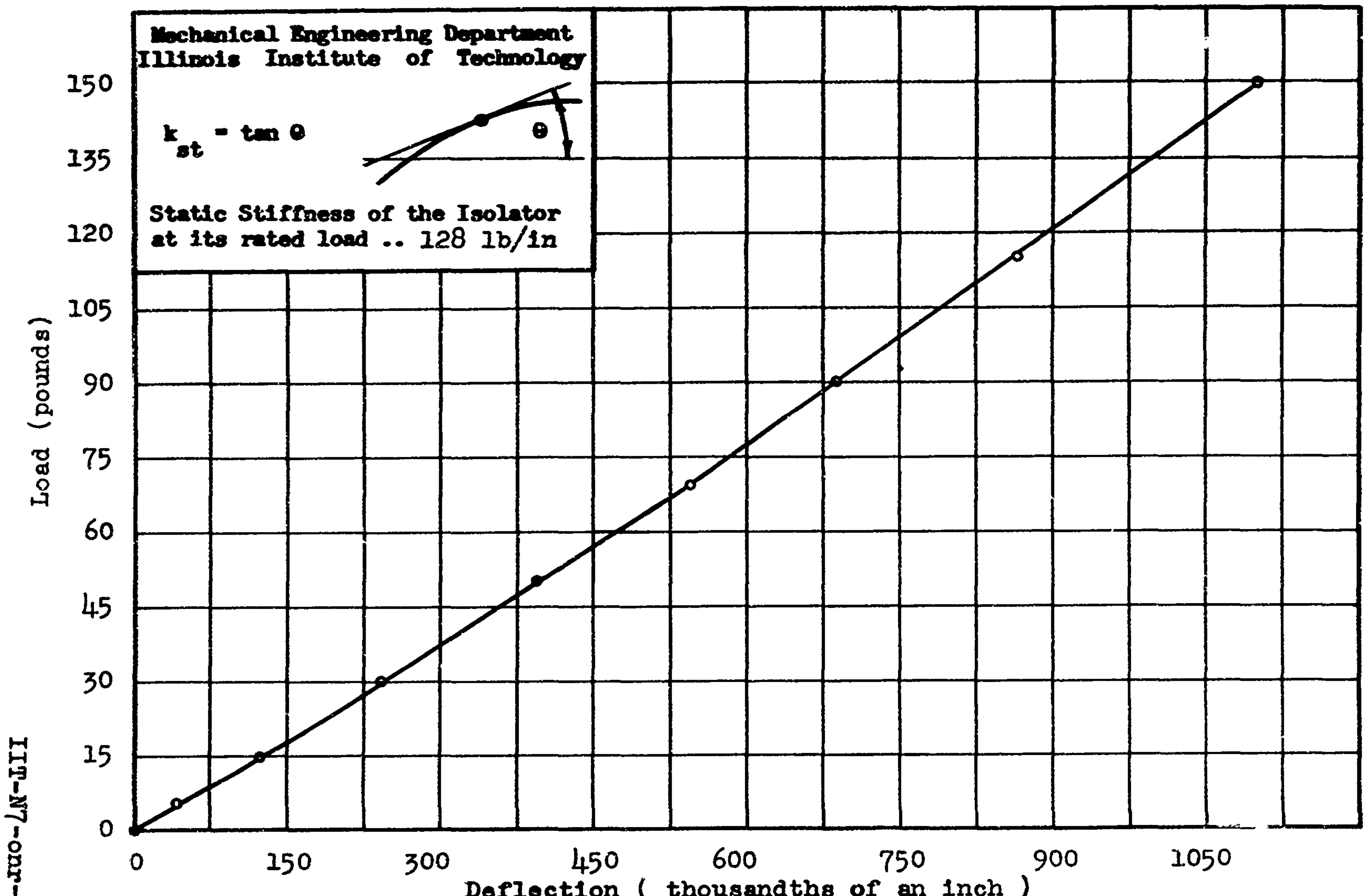
036M-b

IIT-N7-onr-32904



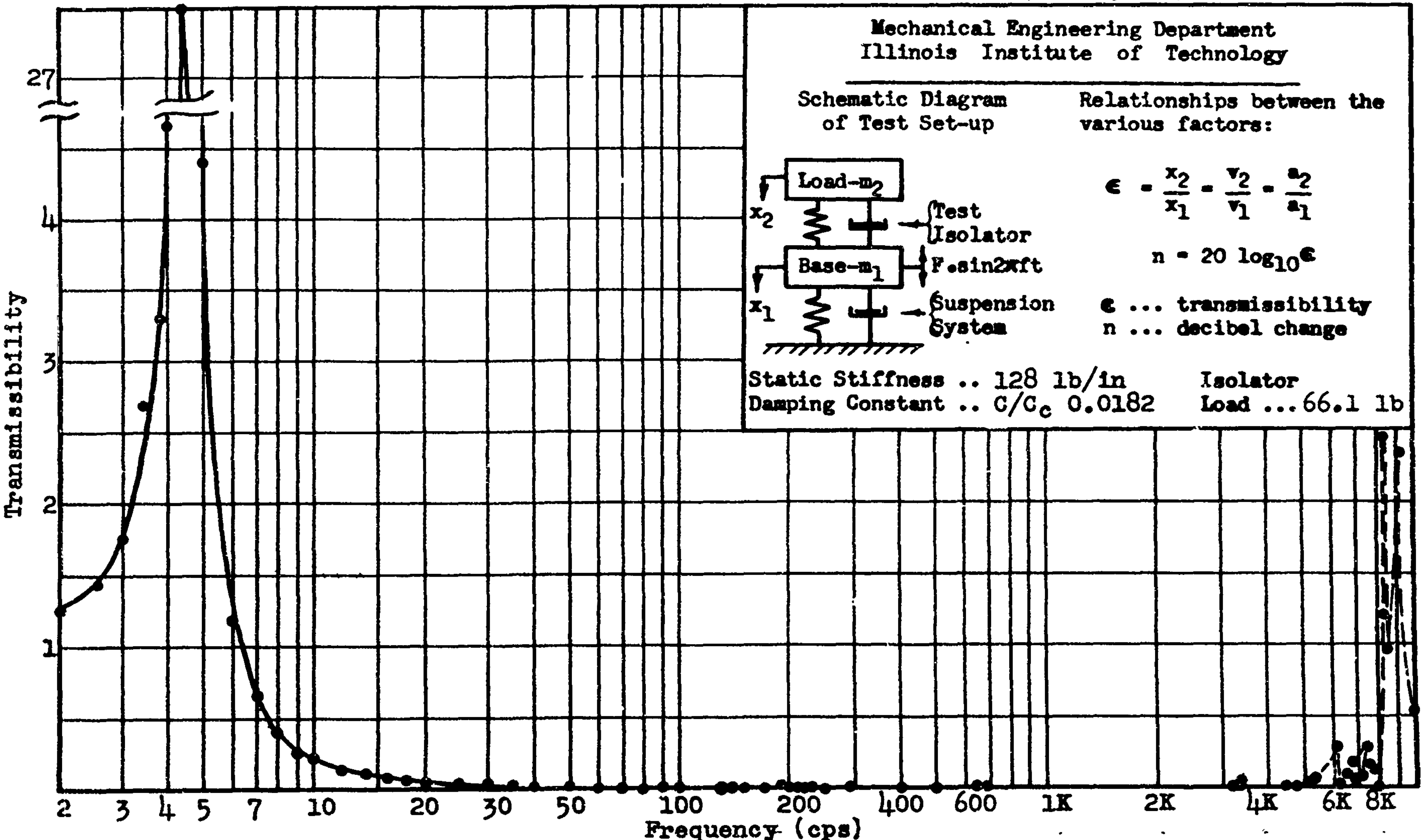
$\log_{10}(v_2/v_1)$ vs Frequency Curve - MB 1733.2

036M-c



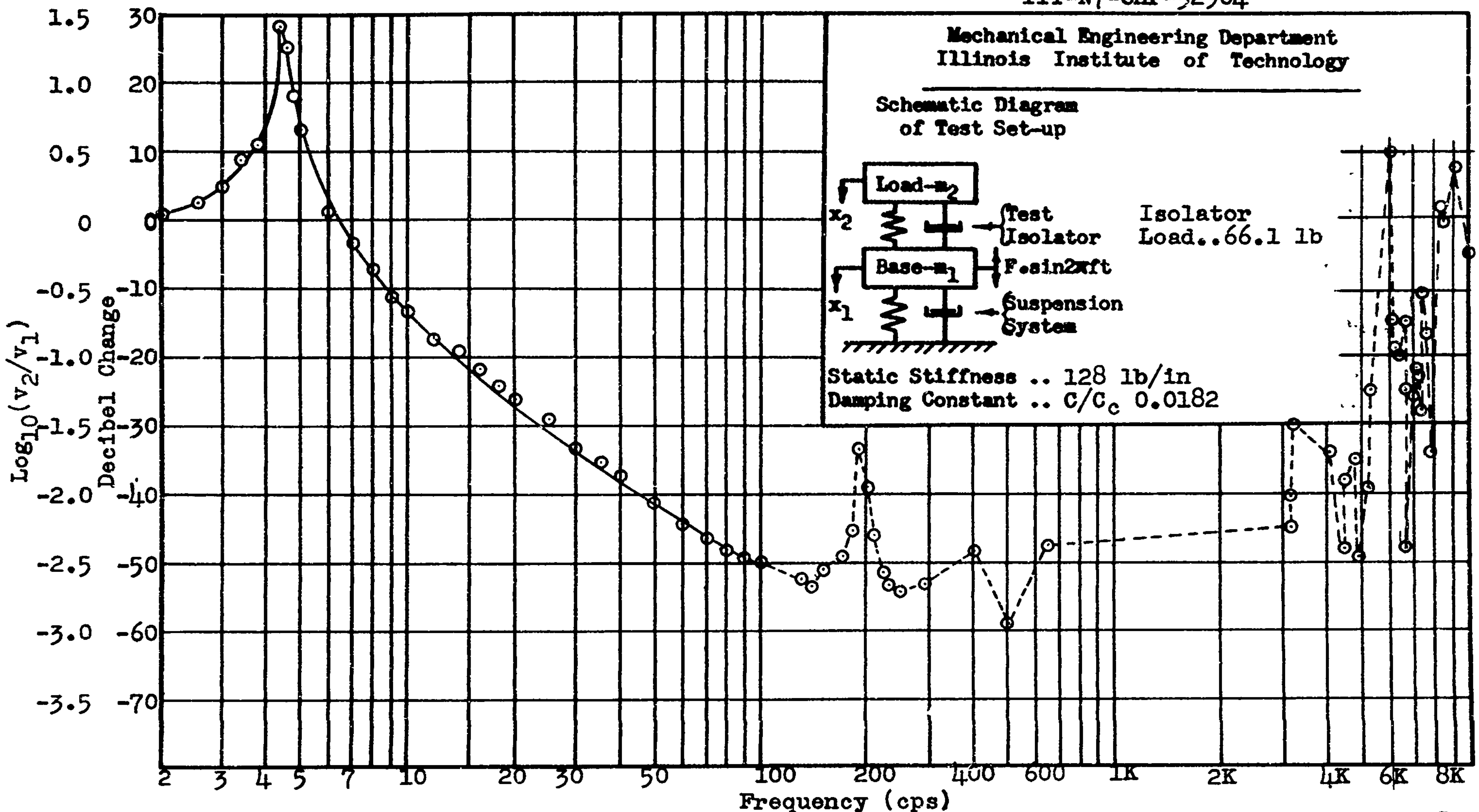
Load-Deflection Curve - Barry 712-13

IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Barry 712-13

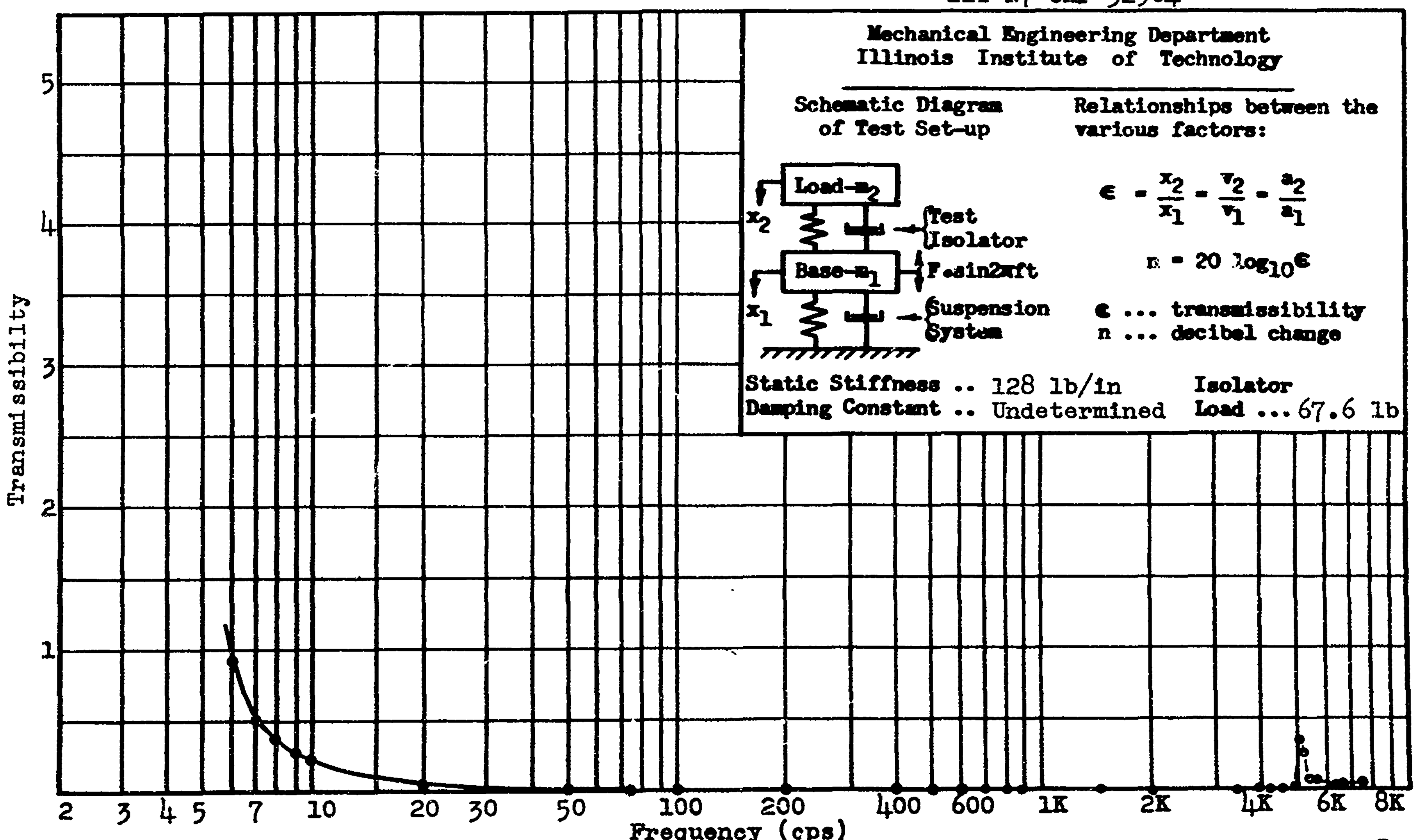
038B-b



$\mathrm{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Barry 712-13

038B-c

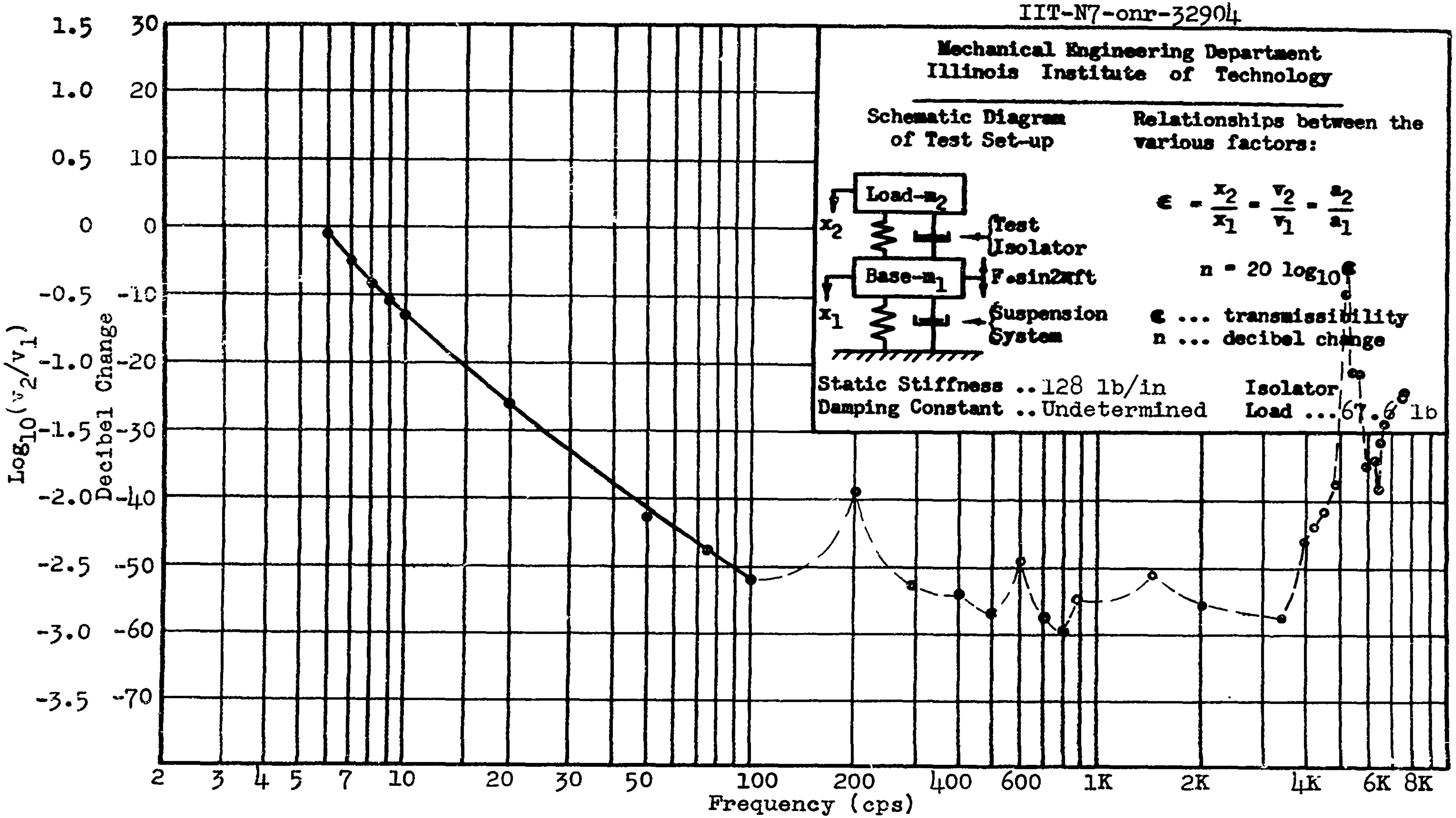
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Barry 712-13

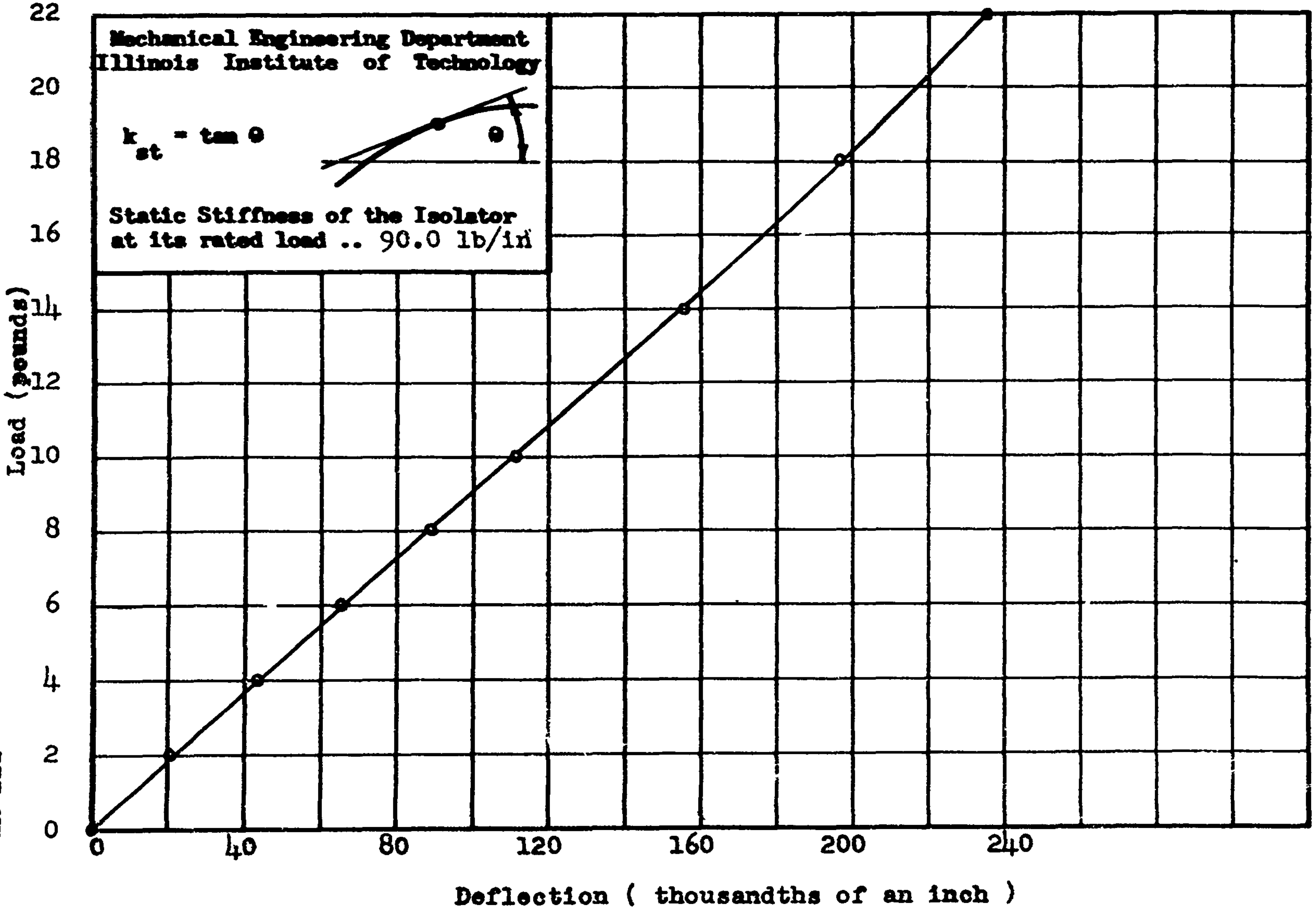
038B-b

IIT-N7-onr-32904



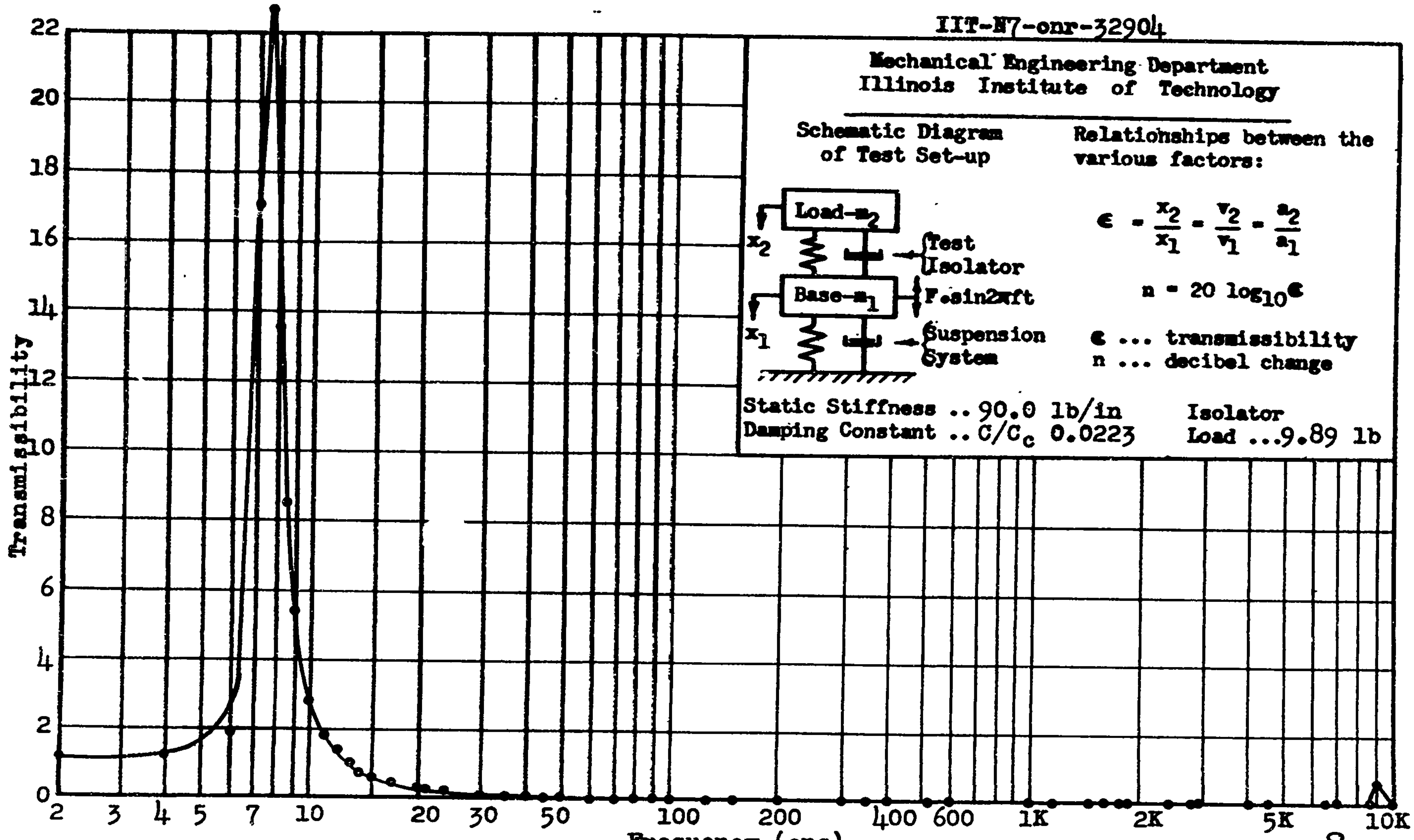
$\log_{10}(v_2/v_1)$ vs Frequency Curve - Barry 712-13

038B-c



Load-Deflection Curve - Lord 156 PH 13

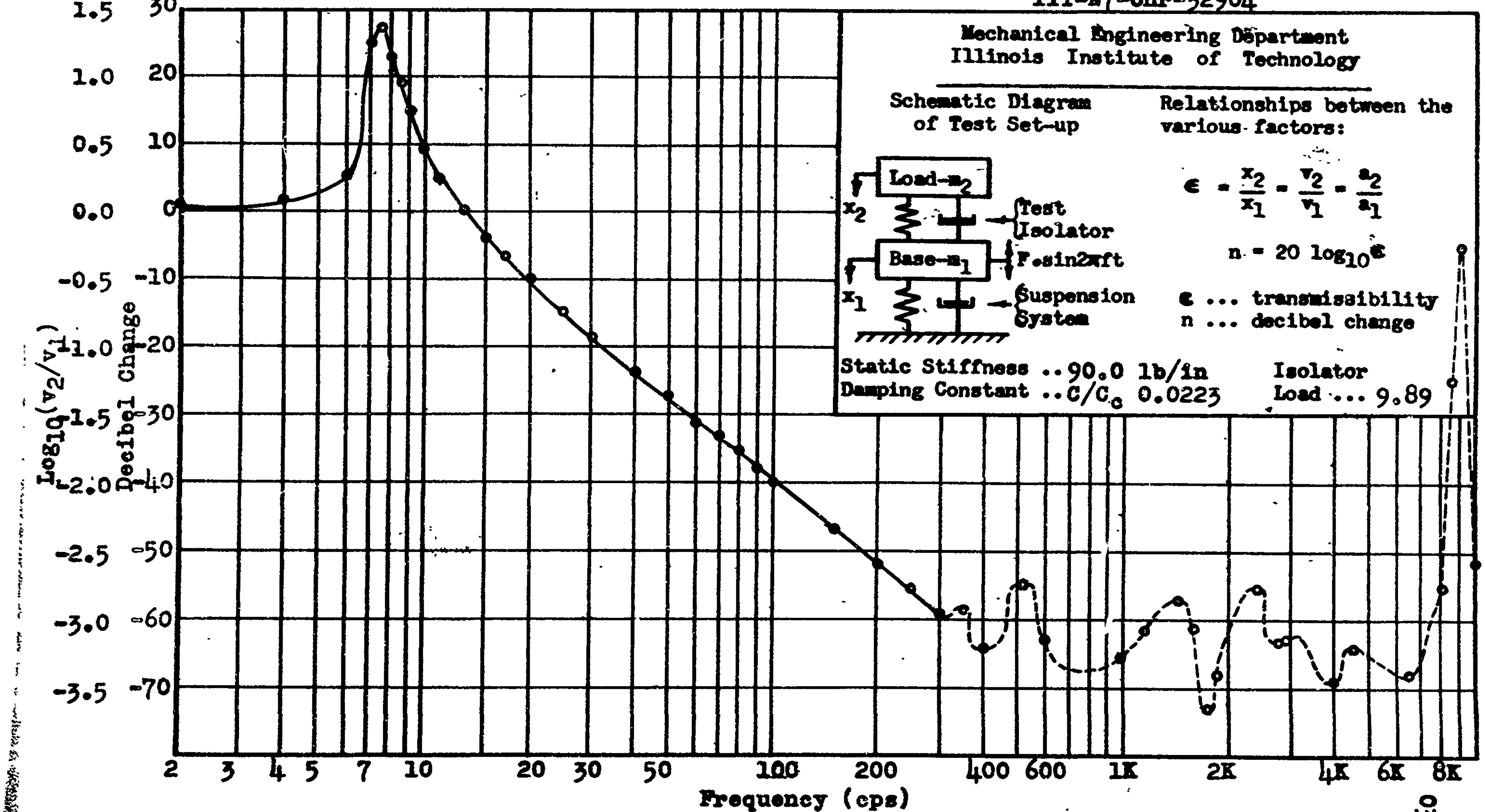
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Lord 156 PH 13

039L-b

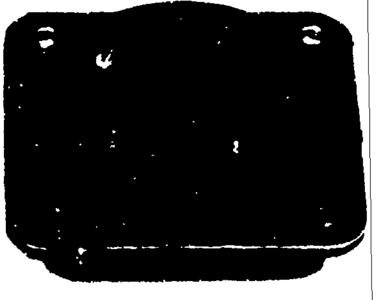
IIT-N7-onr-32904



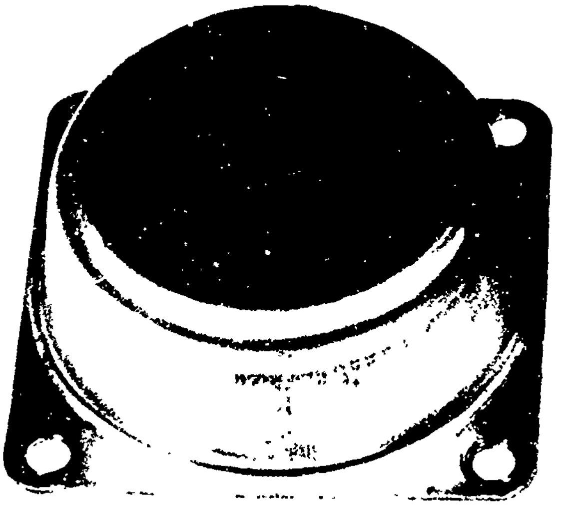
$Log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 156 PH 13

039L-c

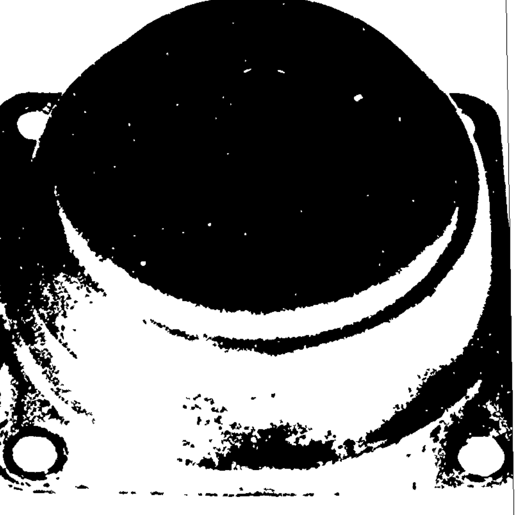
LORD 200PH-20
042 L



MB 1735.6
061 M

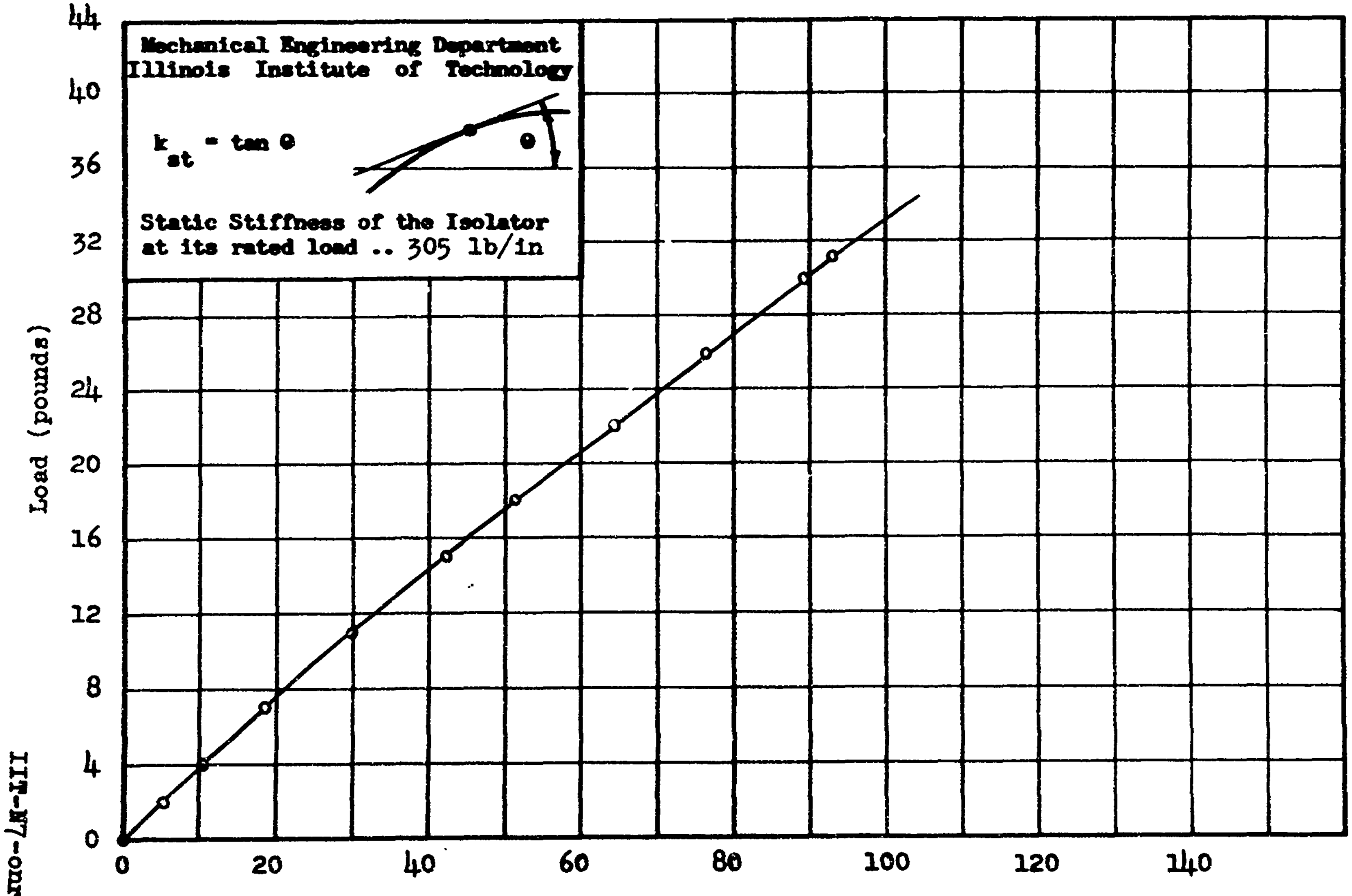


LORD 200PH-35
062 L



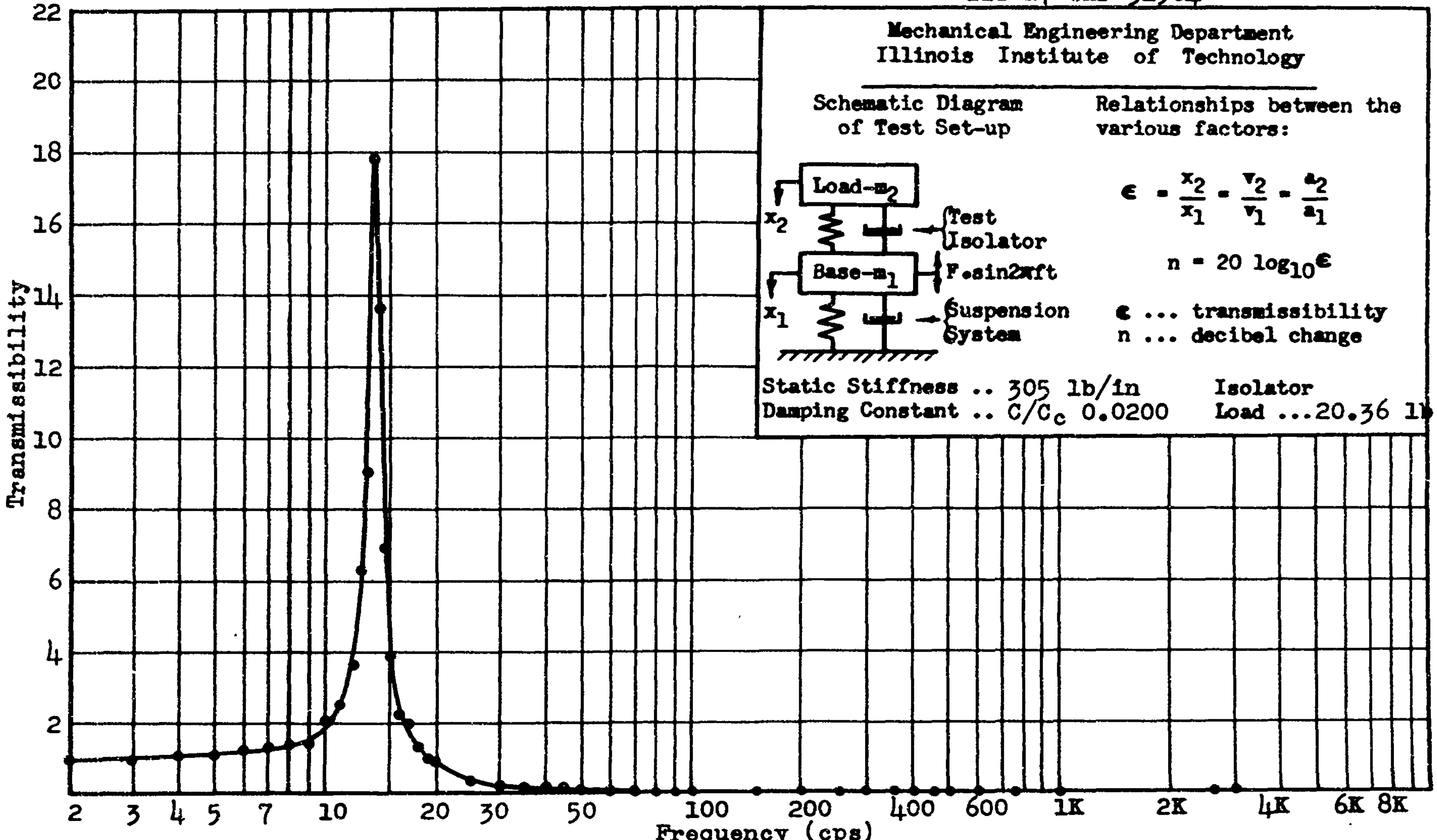
LORD 204PH-35
063 L

PLATE VI-5



Load-Deflection Curve -- Lord 200 PH 20

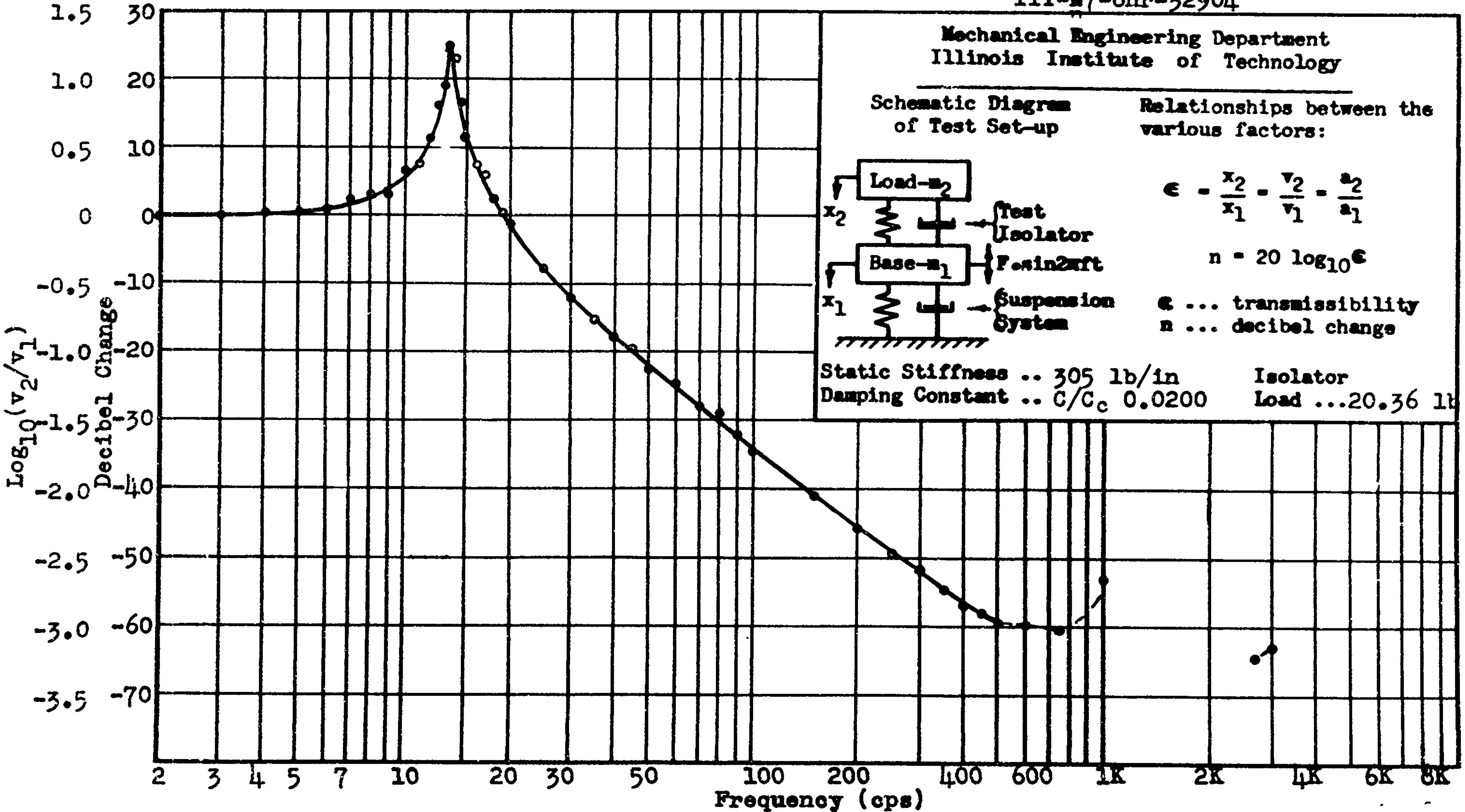
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Lord 200 PH 20

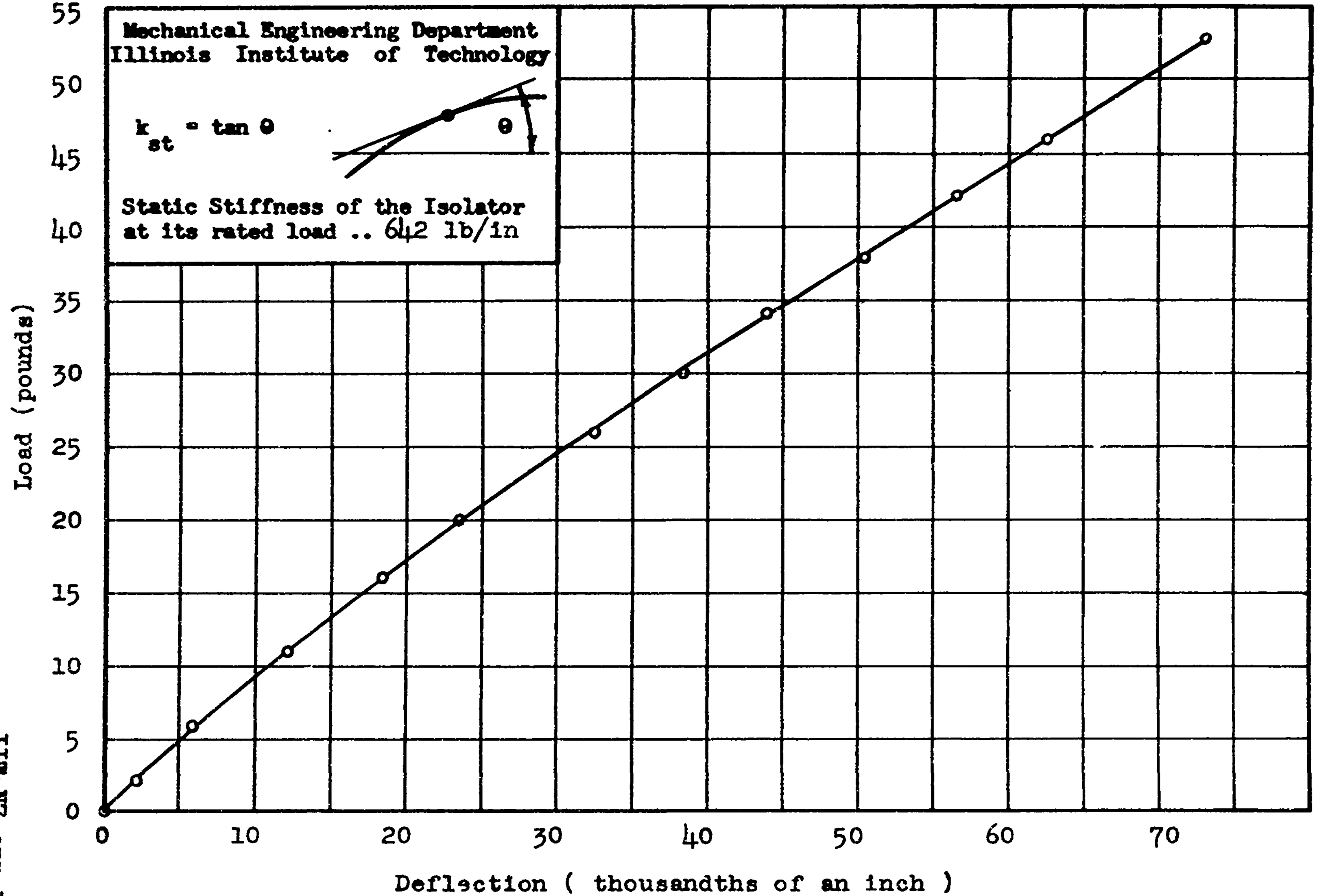
042L-b

IIT-N7-onr-32904



$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 200 PH 20

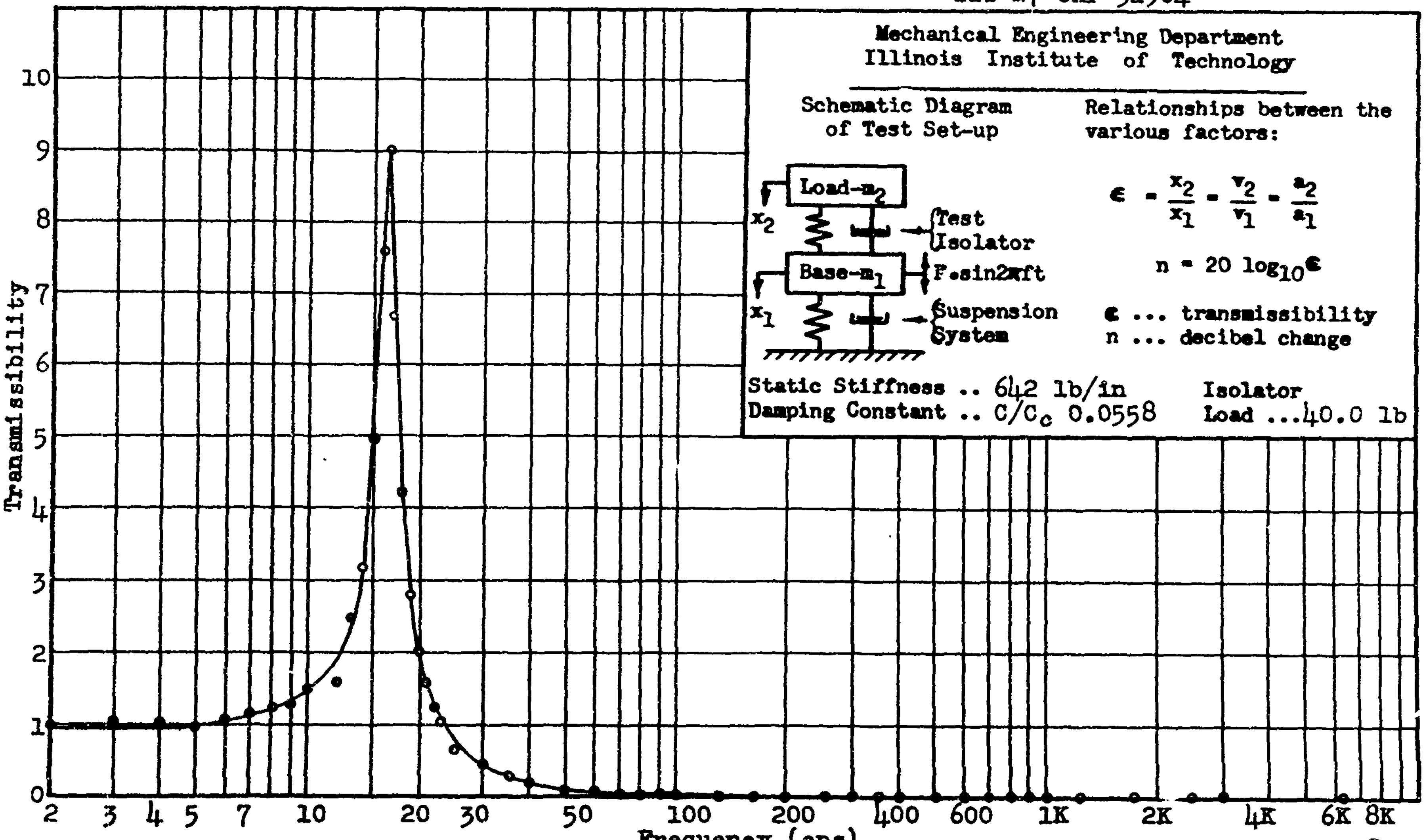
042L-c



Load-Deflection Curve - MB 1735.6

IIT-N7-onr-32904

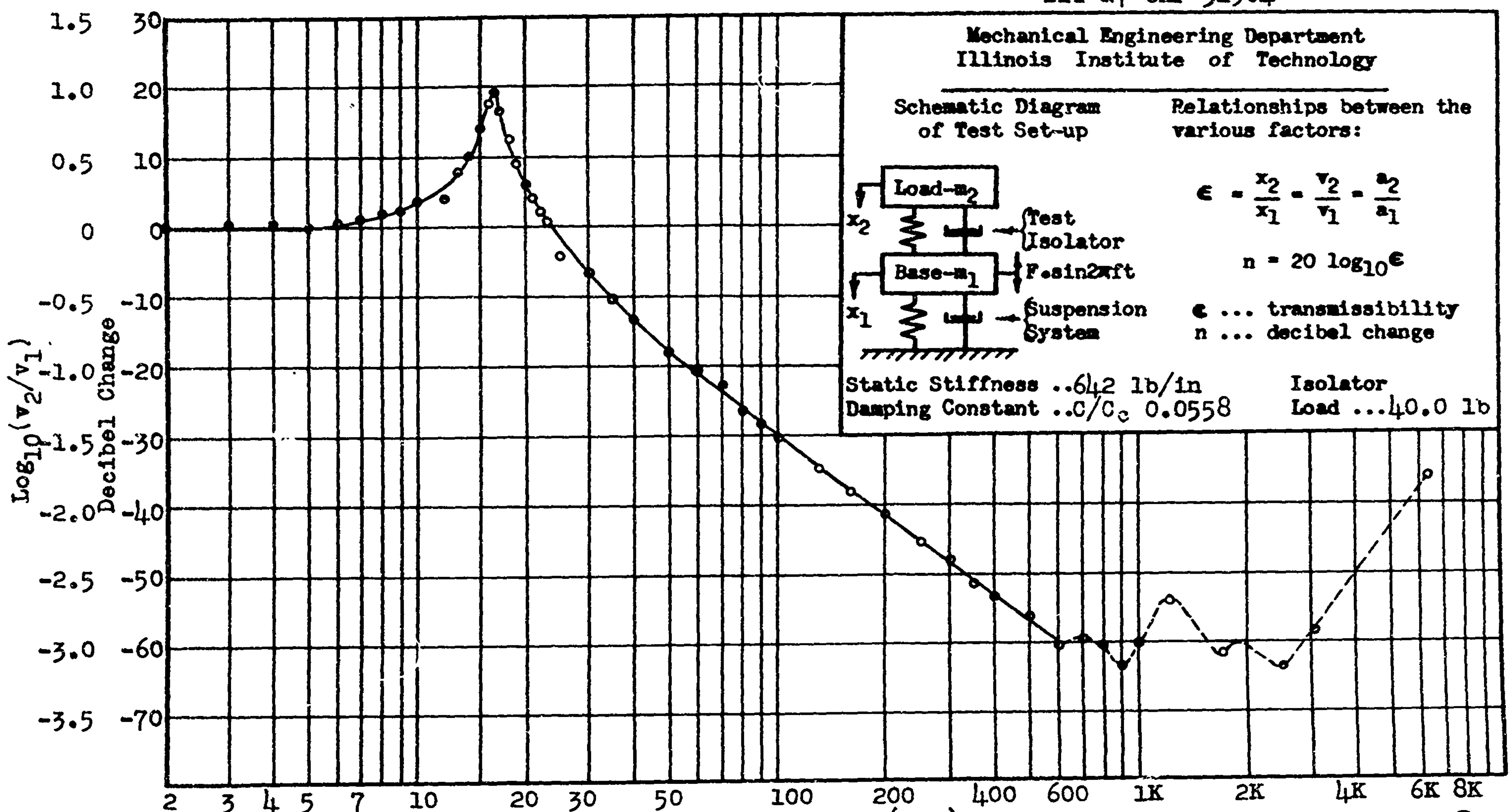
061M-a



Transmissibility vs Frequency Curve - MB 1735.6

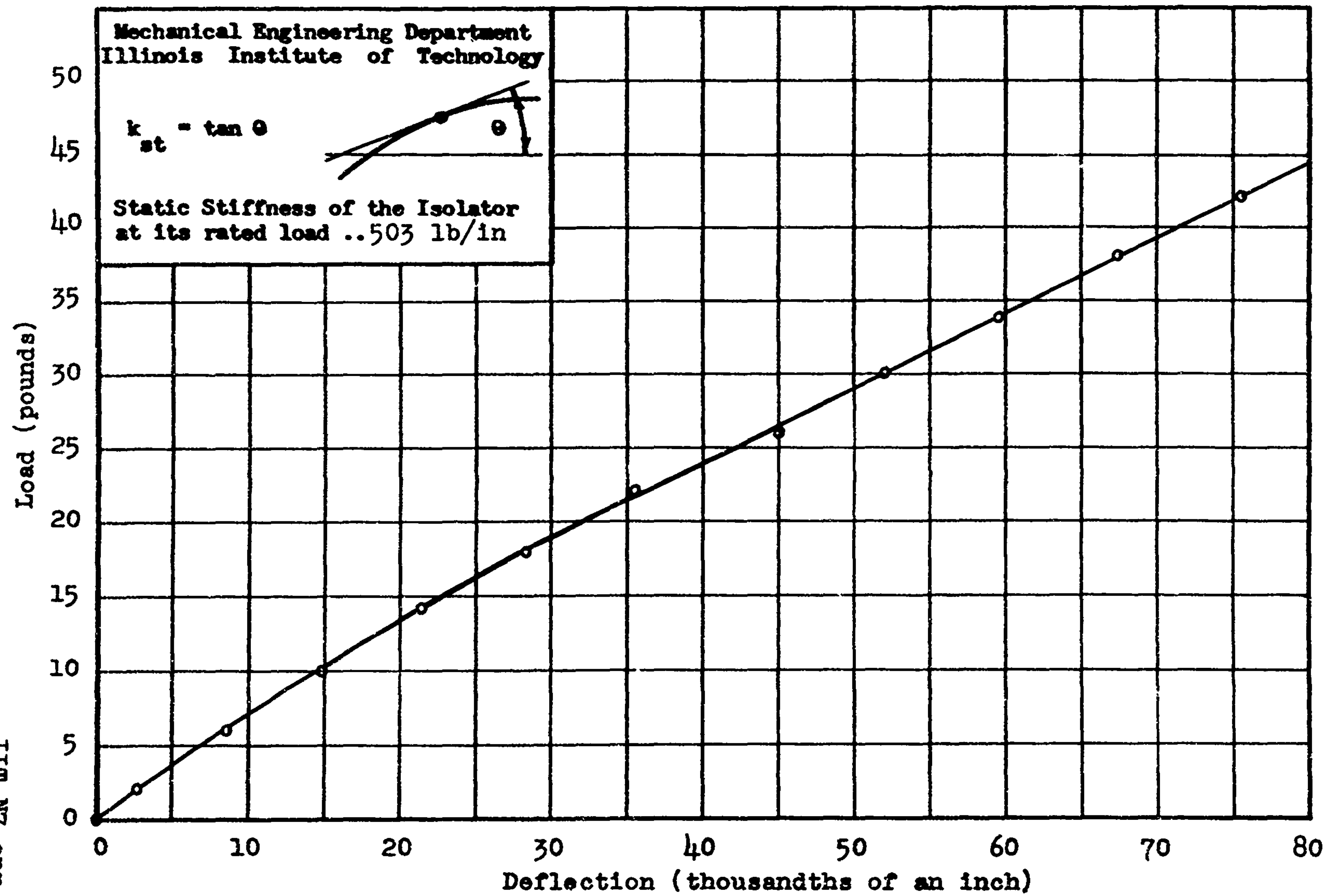
061M-b

IIT-N7-onr-32904



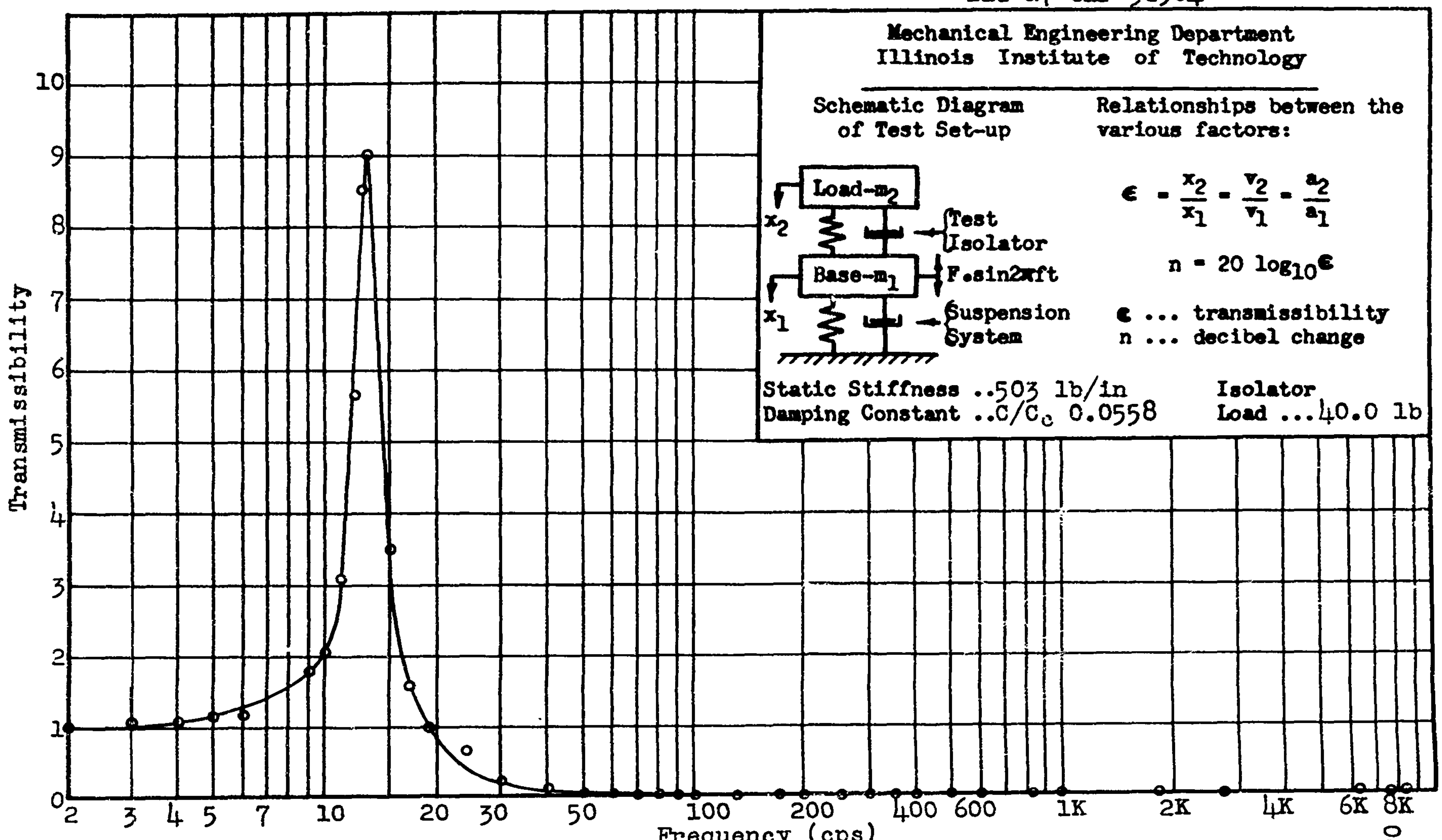
$\log_{10}(v_2/v_1)$ vs Frequency Curve MB 1735.6

061M-c



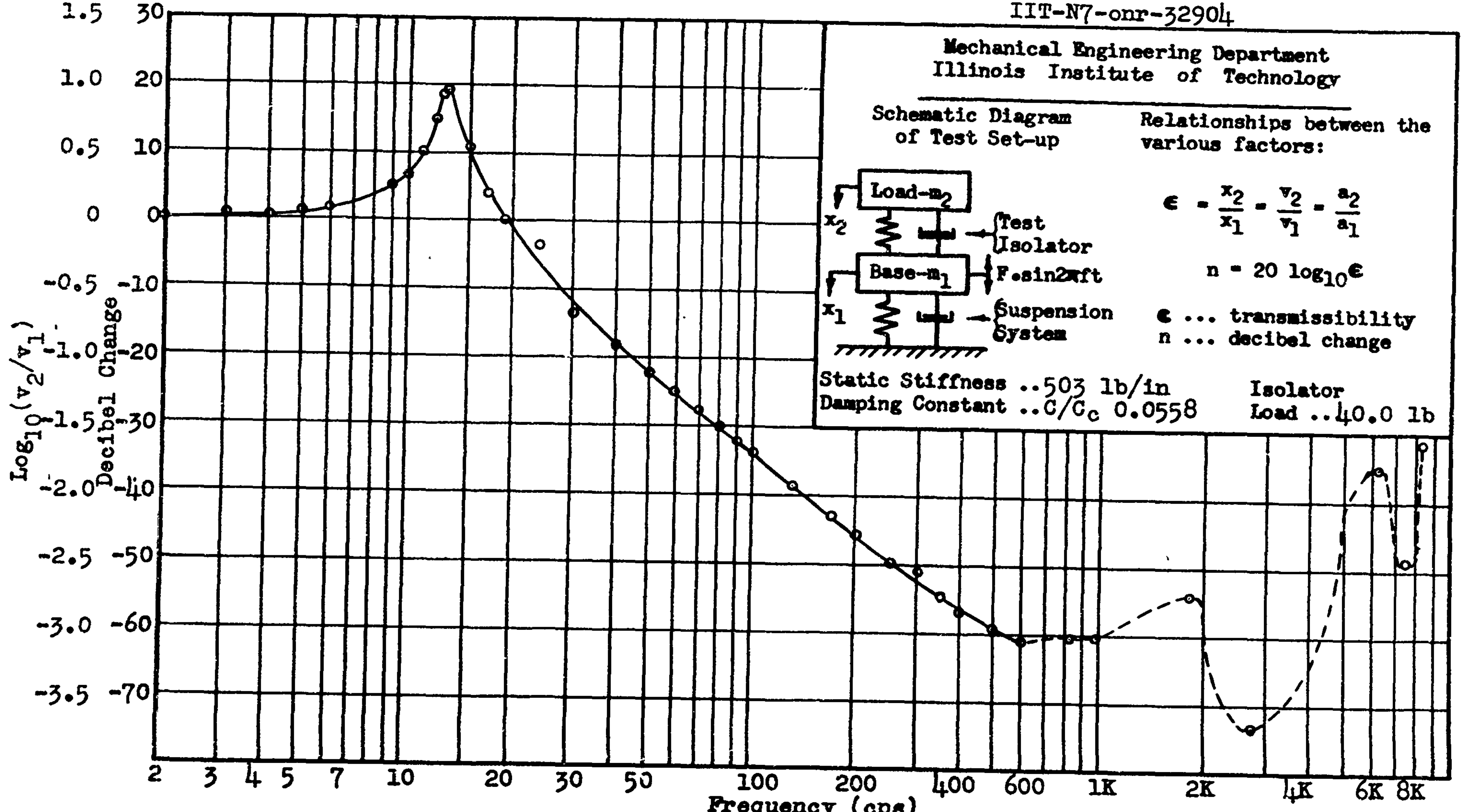
Load-Deflection Curve - Lord 200PH35

IIT-N7-onr-32904



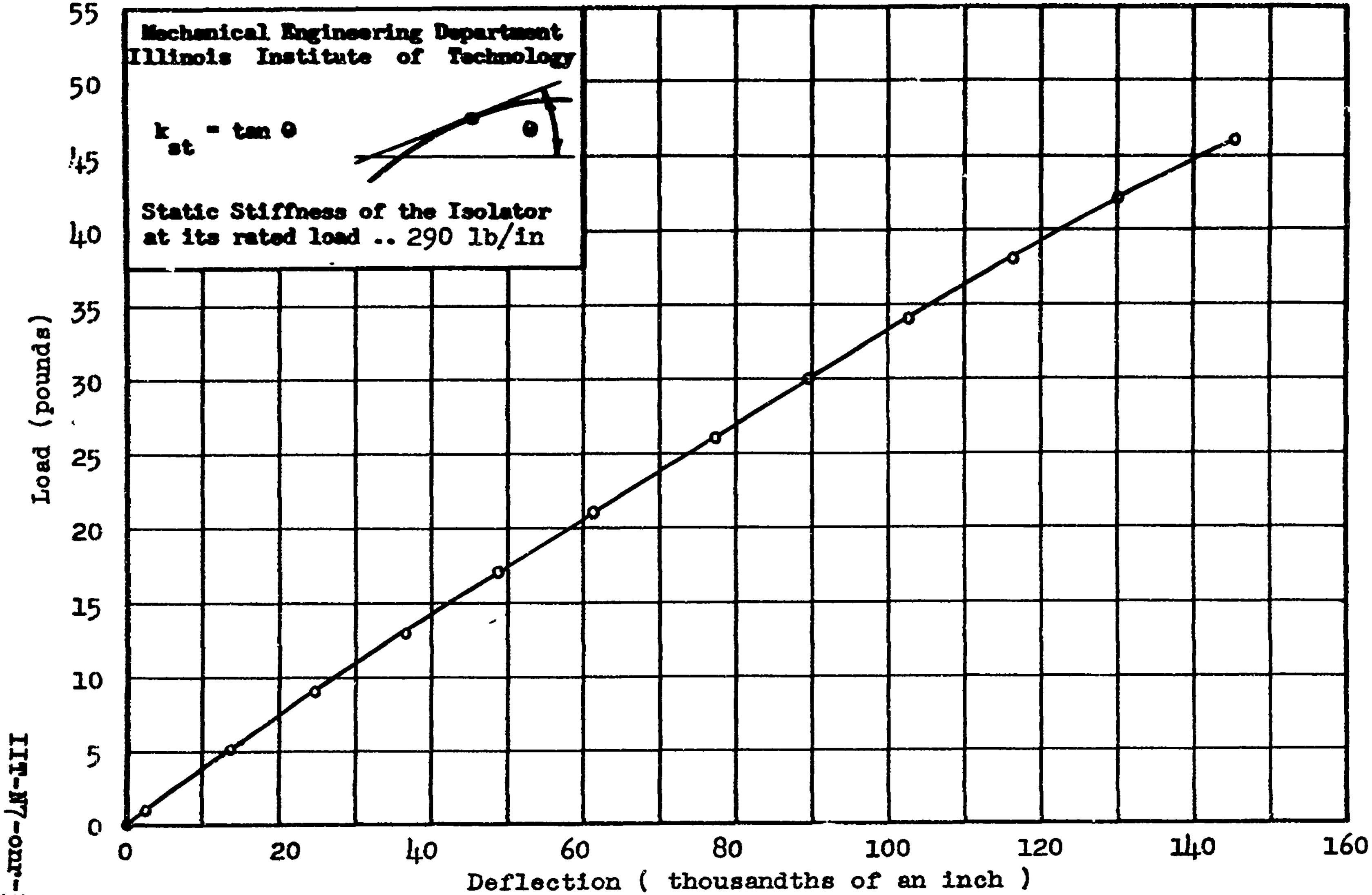
Transmissibility vs Frequency Curve - Lord 200 PH 35

062L-b



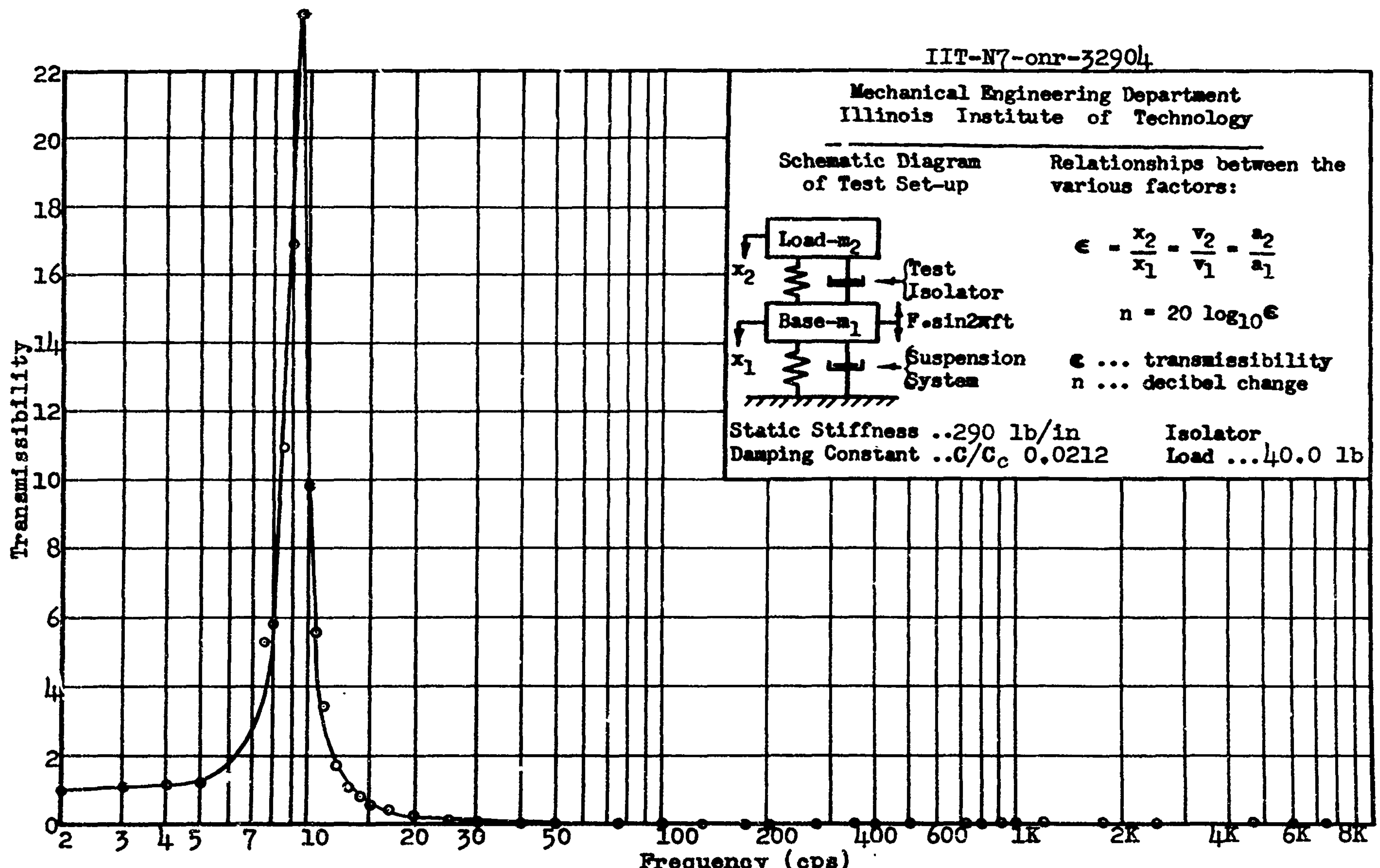
$Log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 200 PH 35

062L-c



Load-Deflection Curve - Lord 204 PH 35

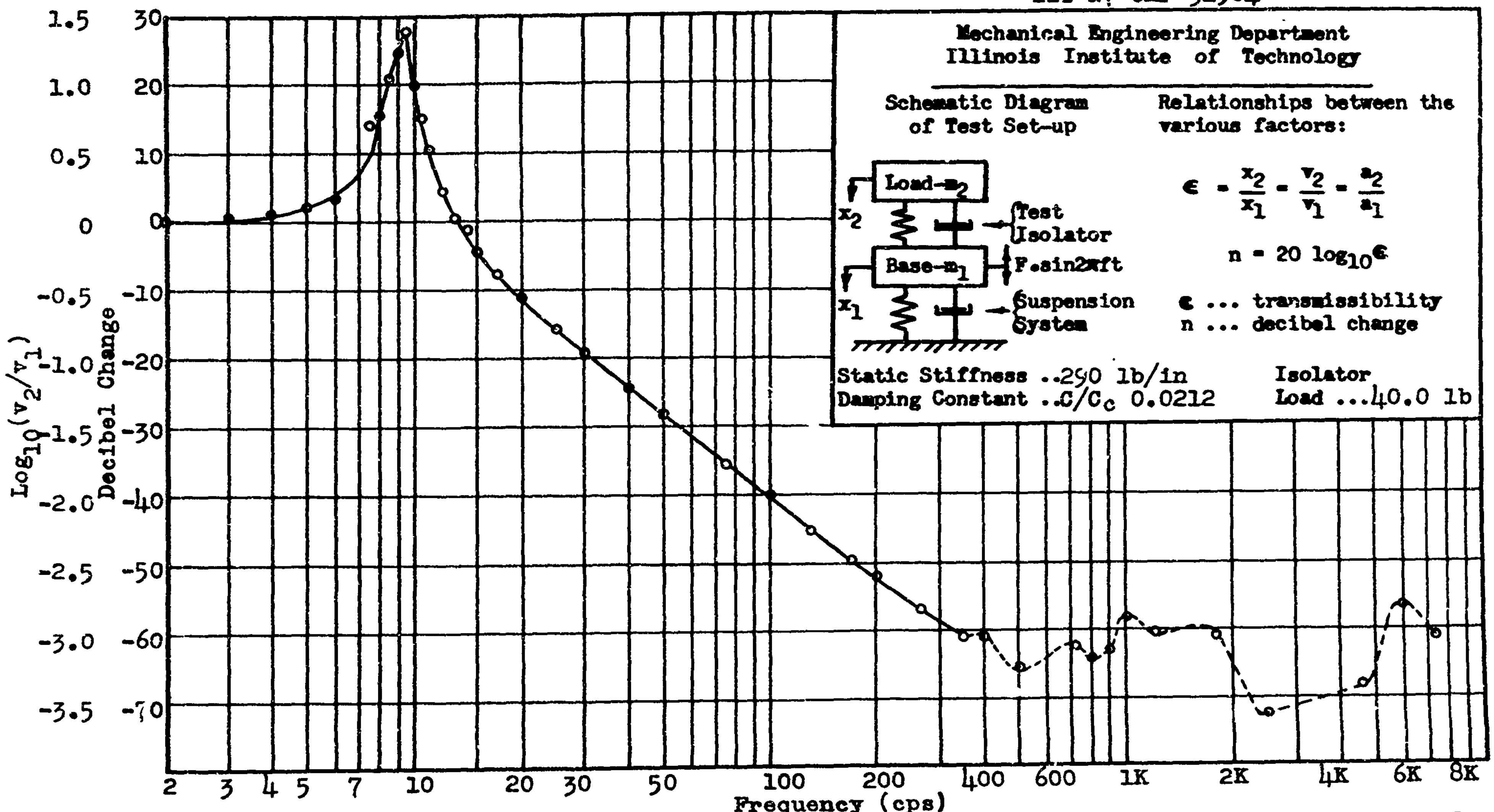
IIT-N7-onr-32904



Transmissibility vs Frequency Curve-Lord 204 PH 35

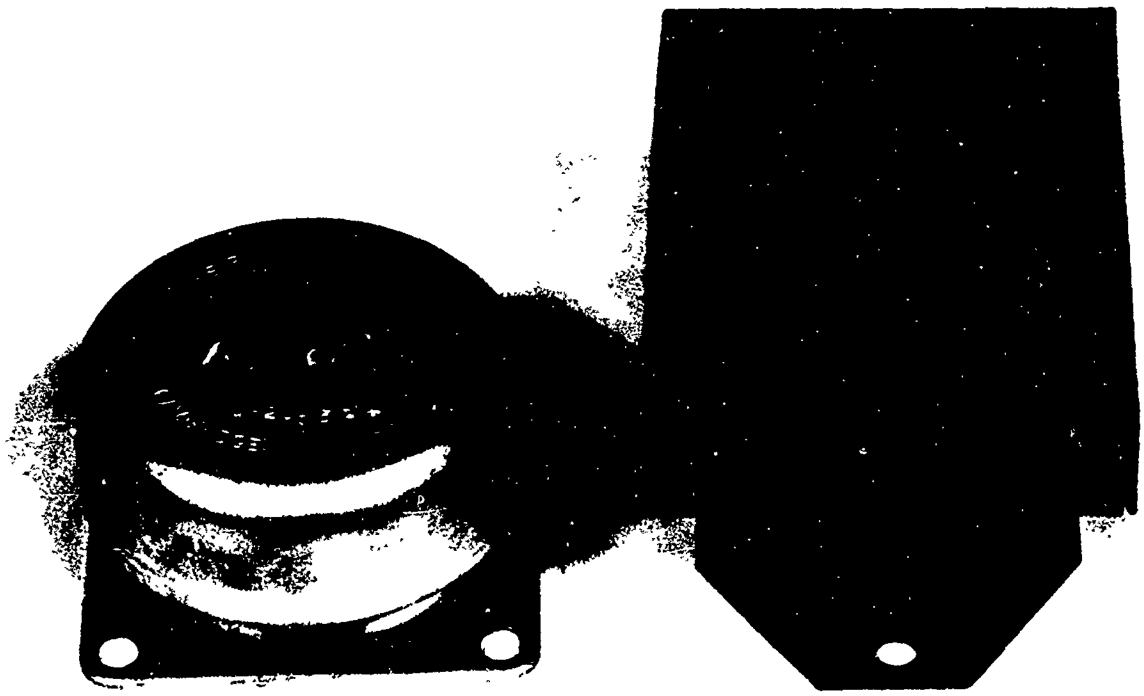
063L-b

IIT-N7-onr-32904



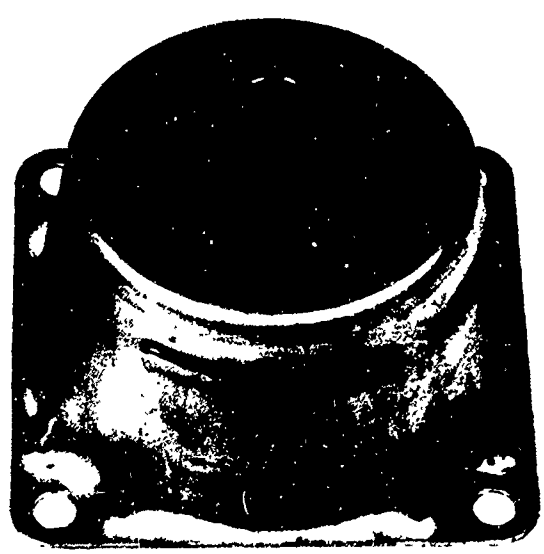
$\mathrm{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 204 PH 35

063L-c



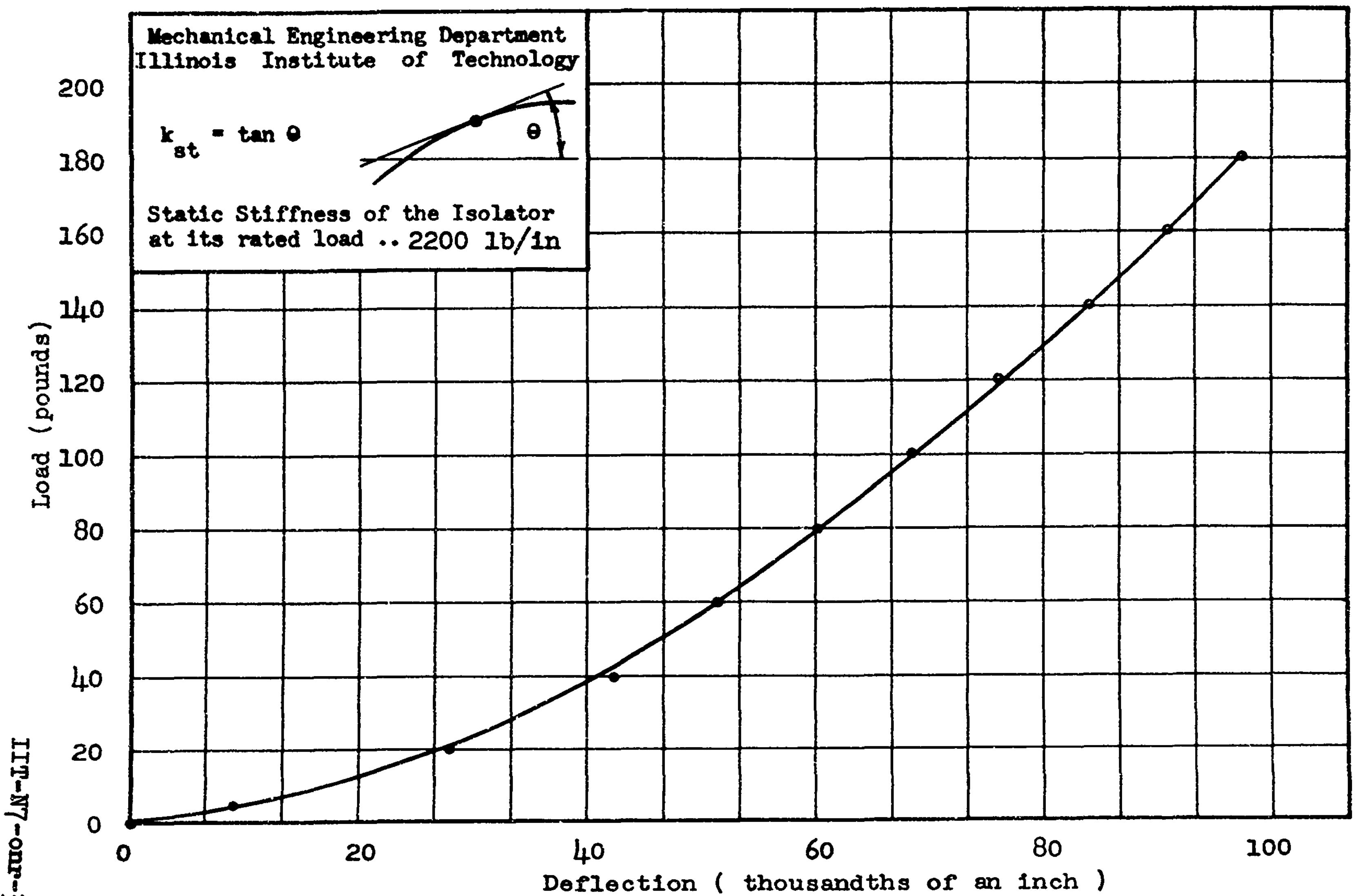
BARRY C2045
064 B

HAMILTON-KENT H-40
066 H



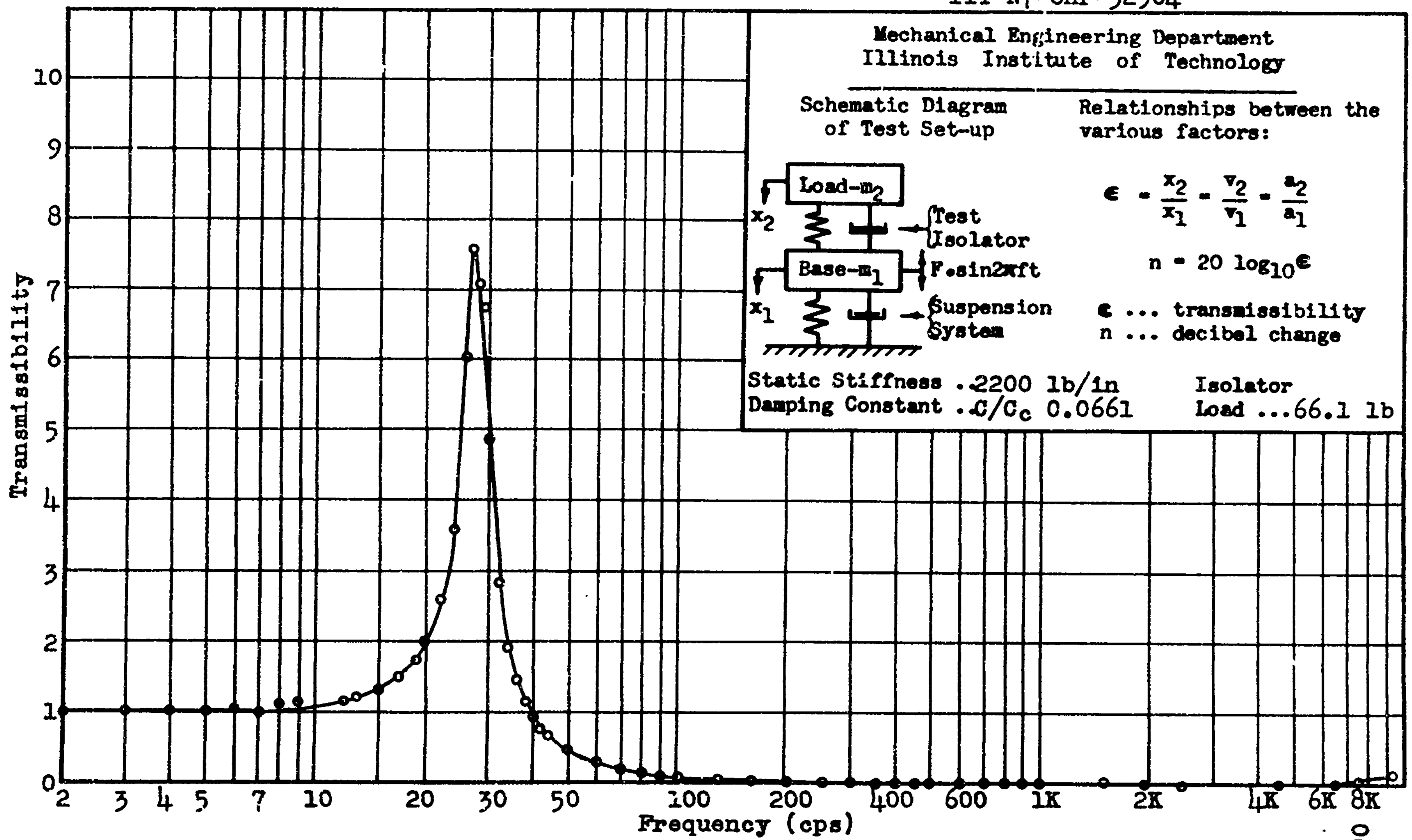
LORD 206PH-45
068 L

PLATE VI-6



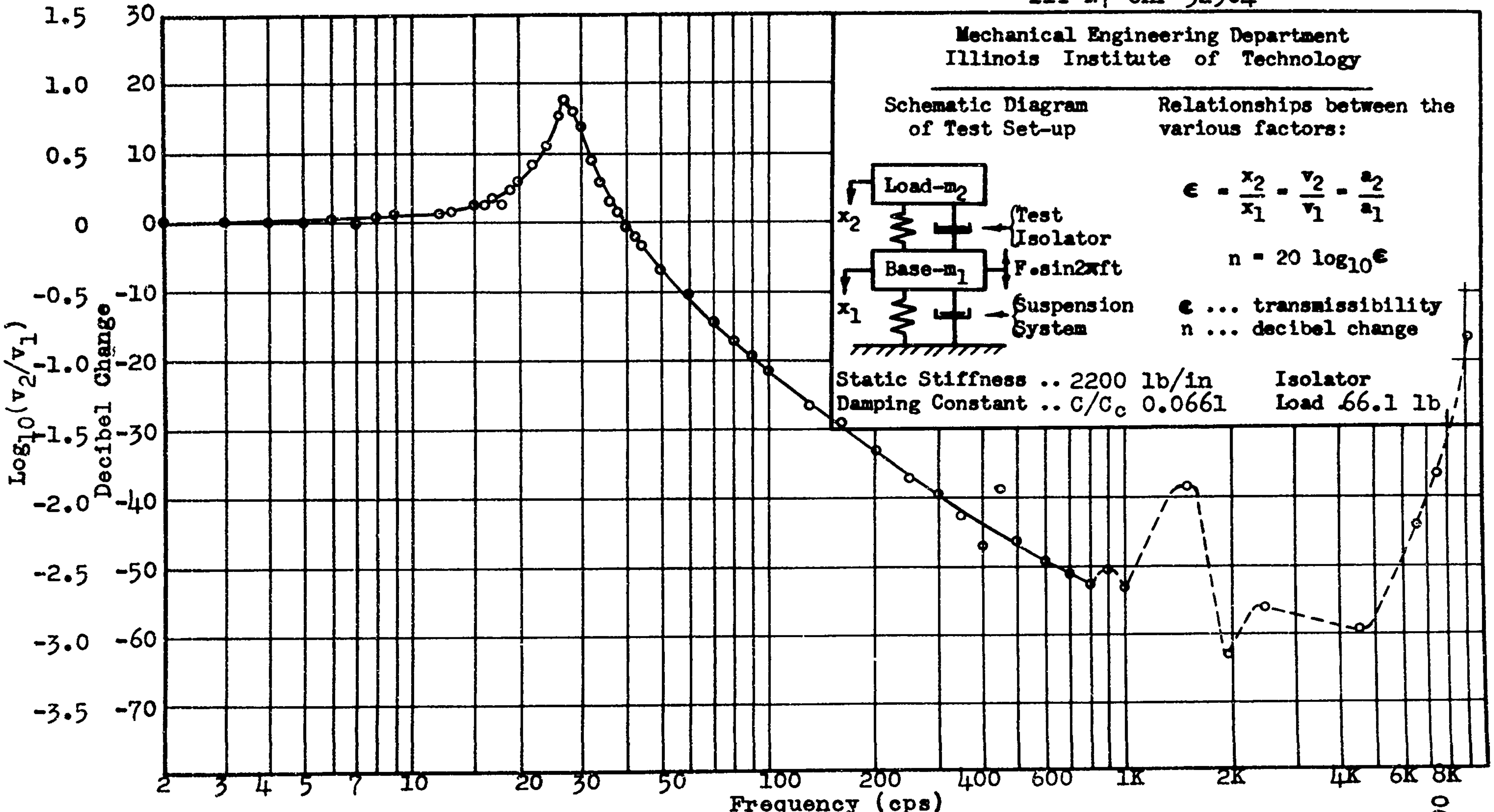
Load-Deflection Curve - Barry C 2045

IIT-N7-onr-32904



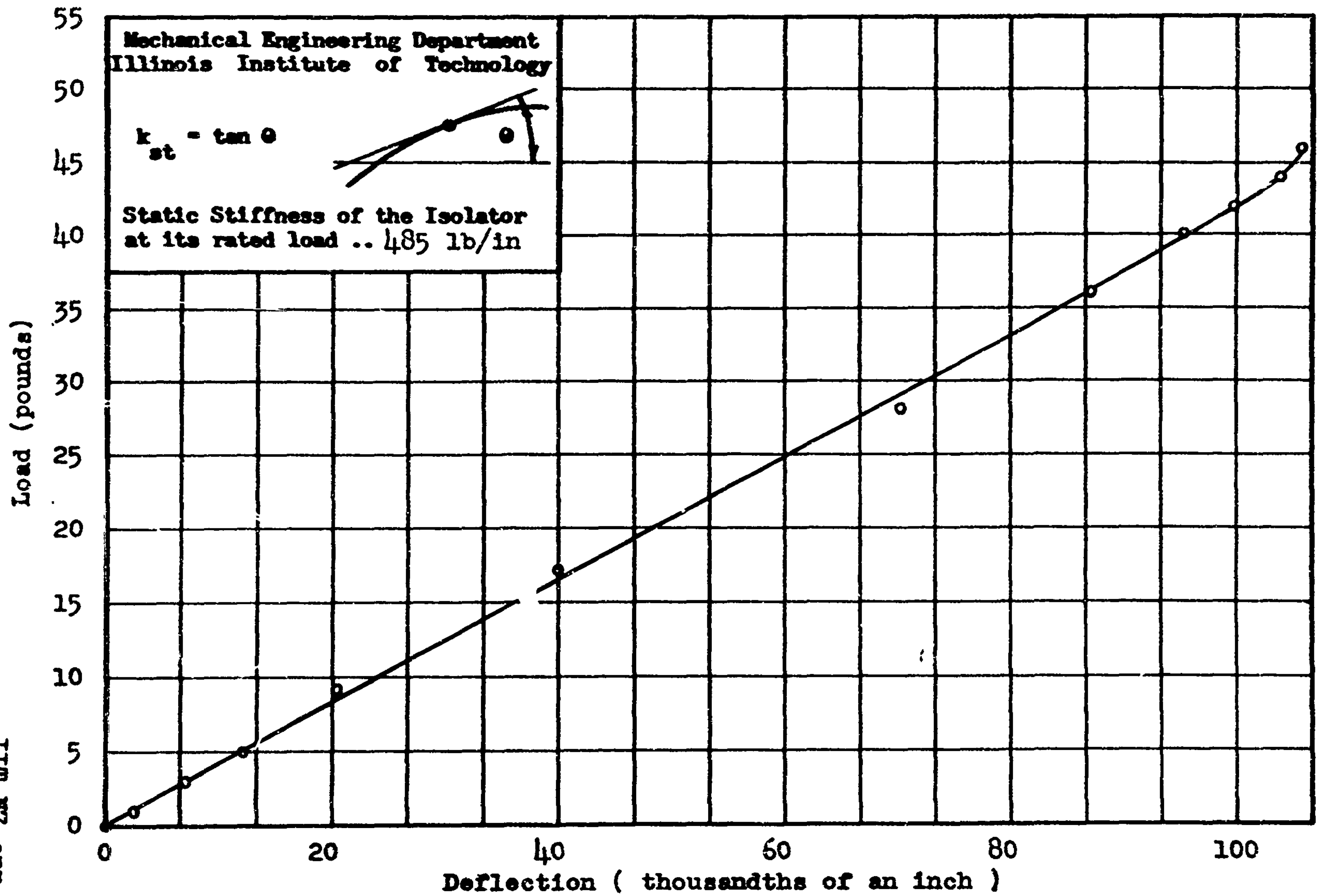
Transmissibility vs Frequency Curve - Barry C 2045

064B-b



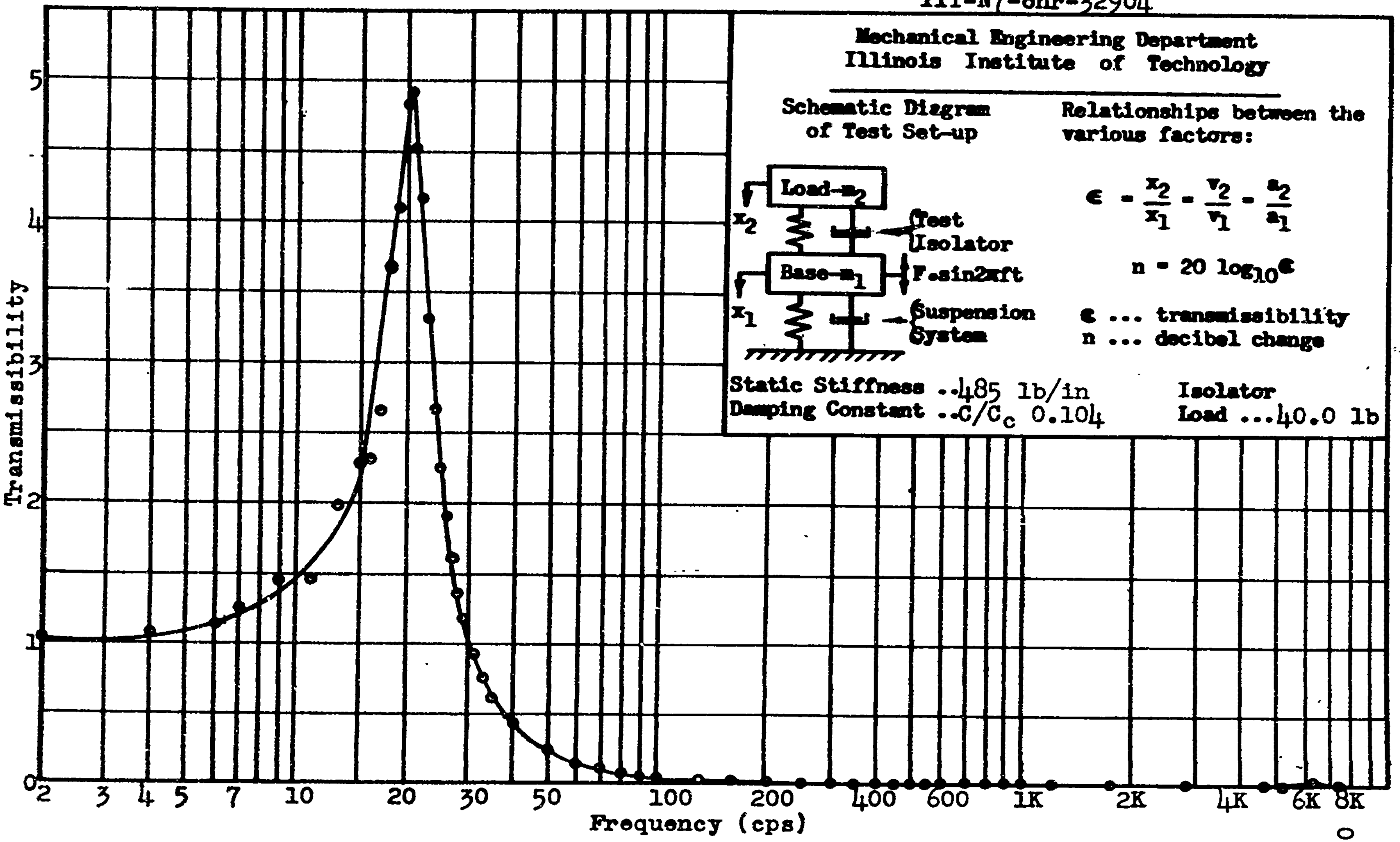
$\log_{10}(v_2/v_1)$ vs Frequency Curve - Barry C 2045

064B-c



Load-Deflection Curve - Hamilton Kent H 40

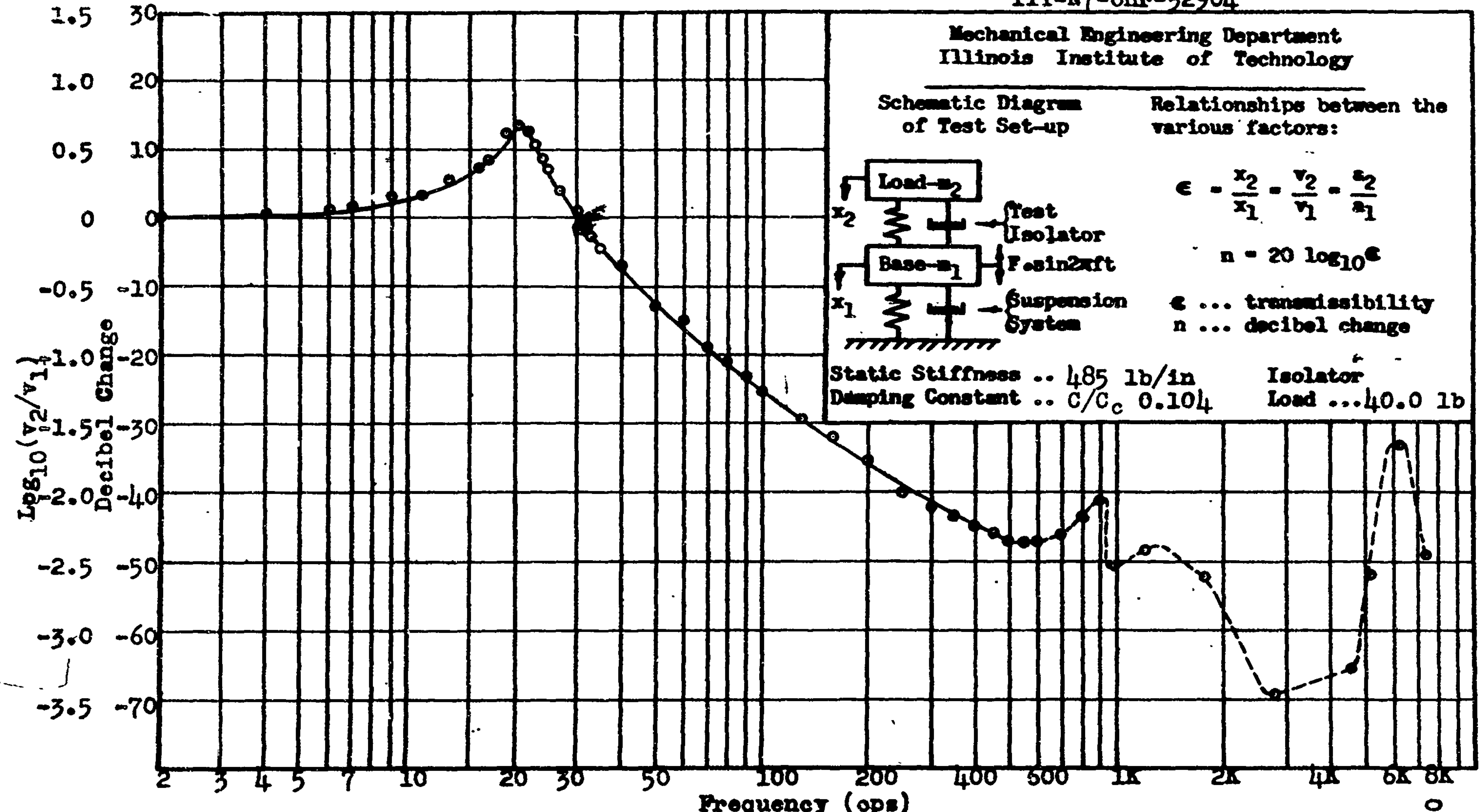
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Hamilton Kent H-40

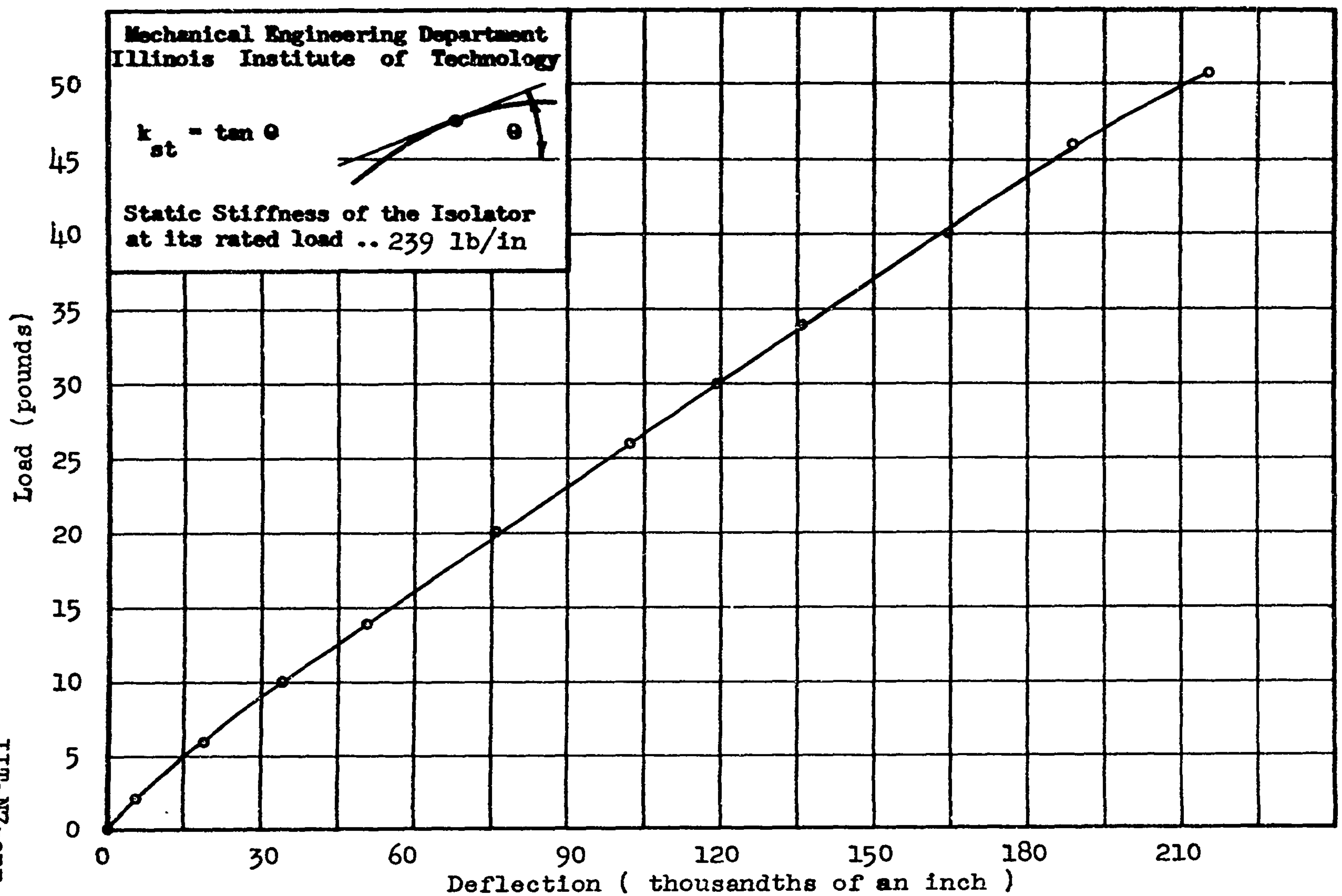
066H-b

IIT-N7-onr-32904

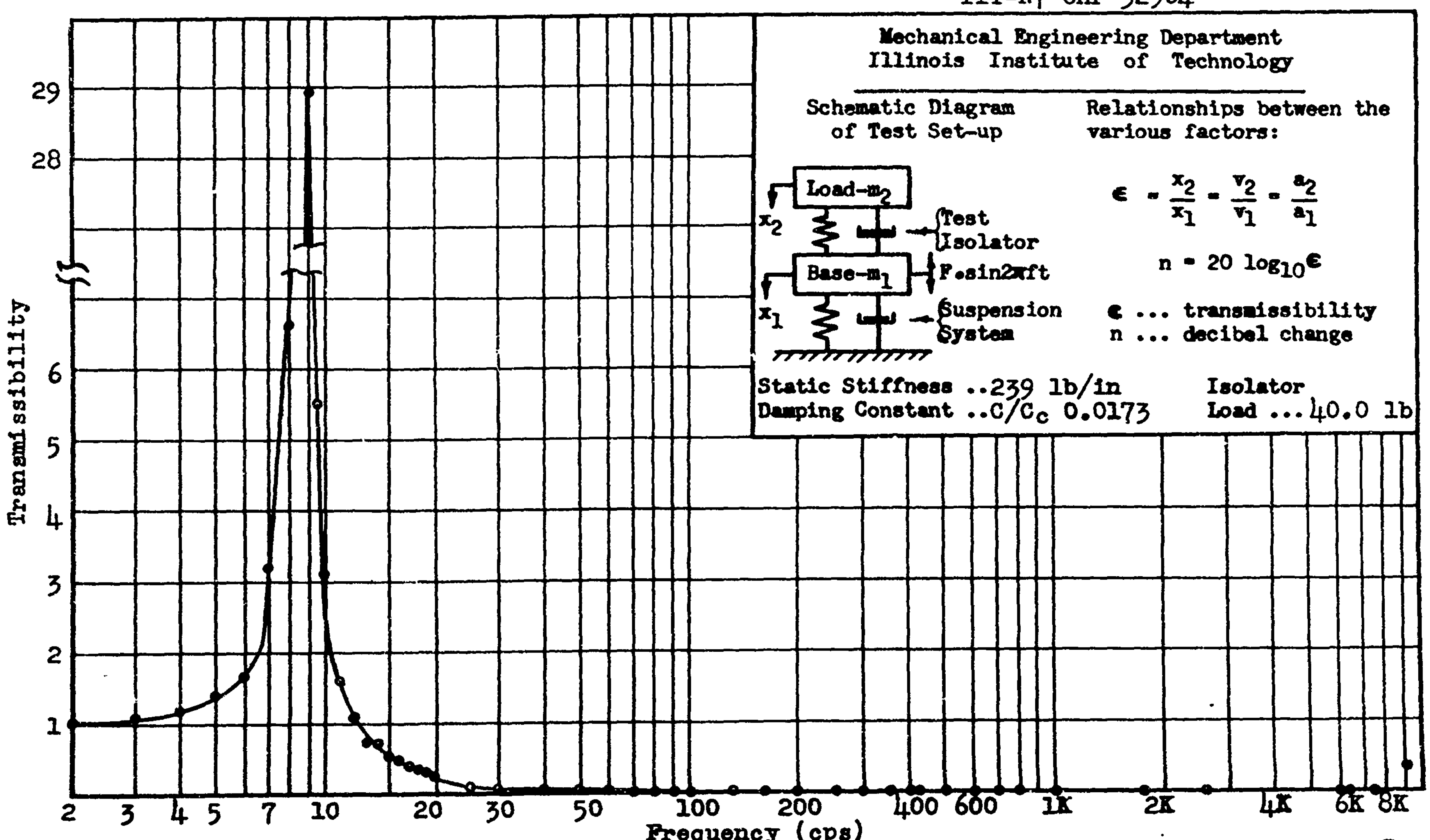


$\log_{10}(v_2/v_1)$ vs Frequency Curve - Hamilton Kent H-40

066H-c



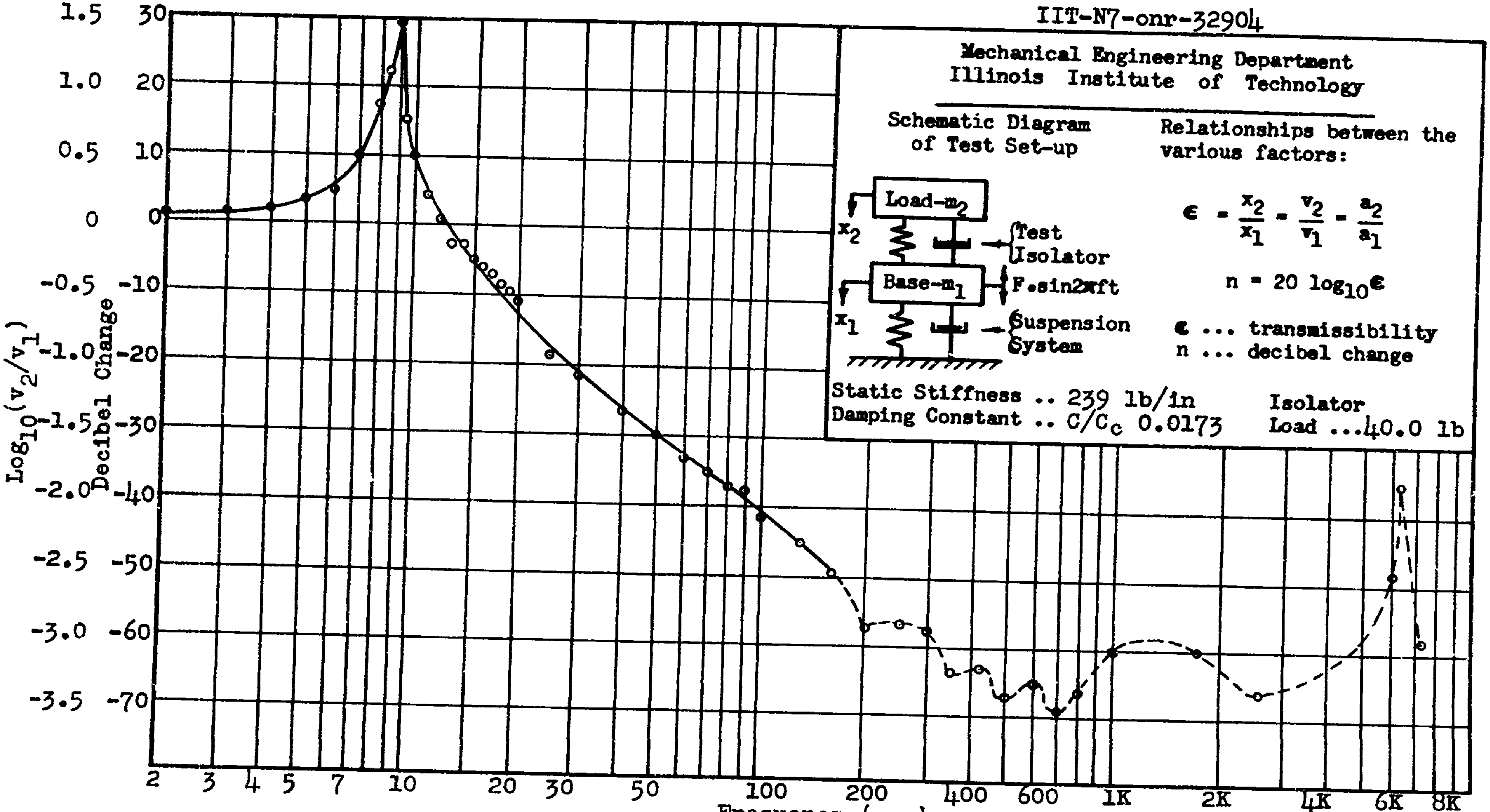
Load-Deflection Curve - Lord 206 PH 45



Transmissibility vs Frequency Curve - Lord 206 PH 45

a-1890

IIT-N7-onr-32904



$\log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 206 PH 45

068L-c

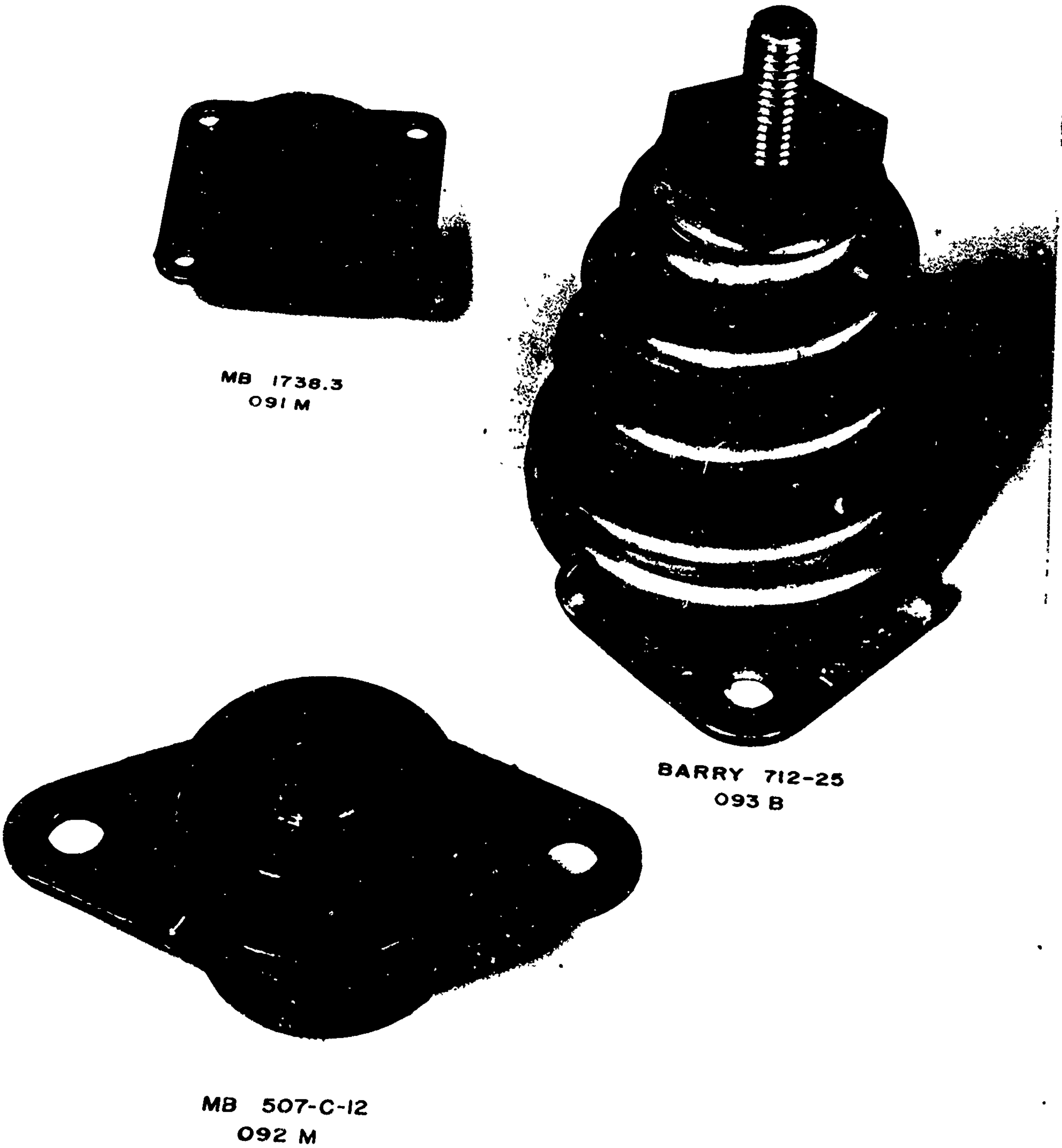
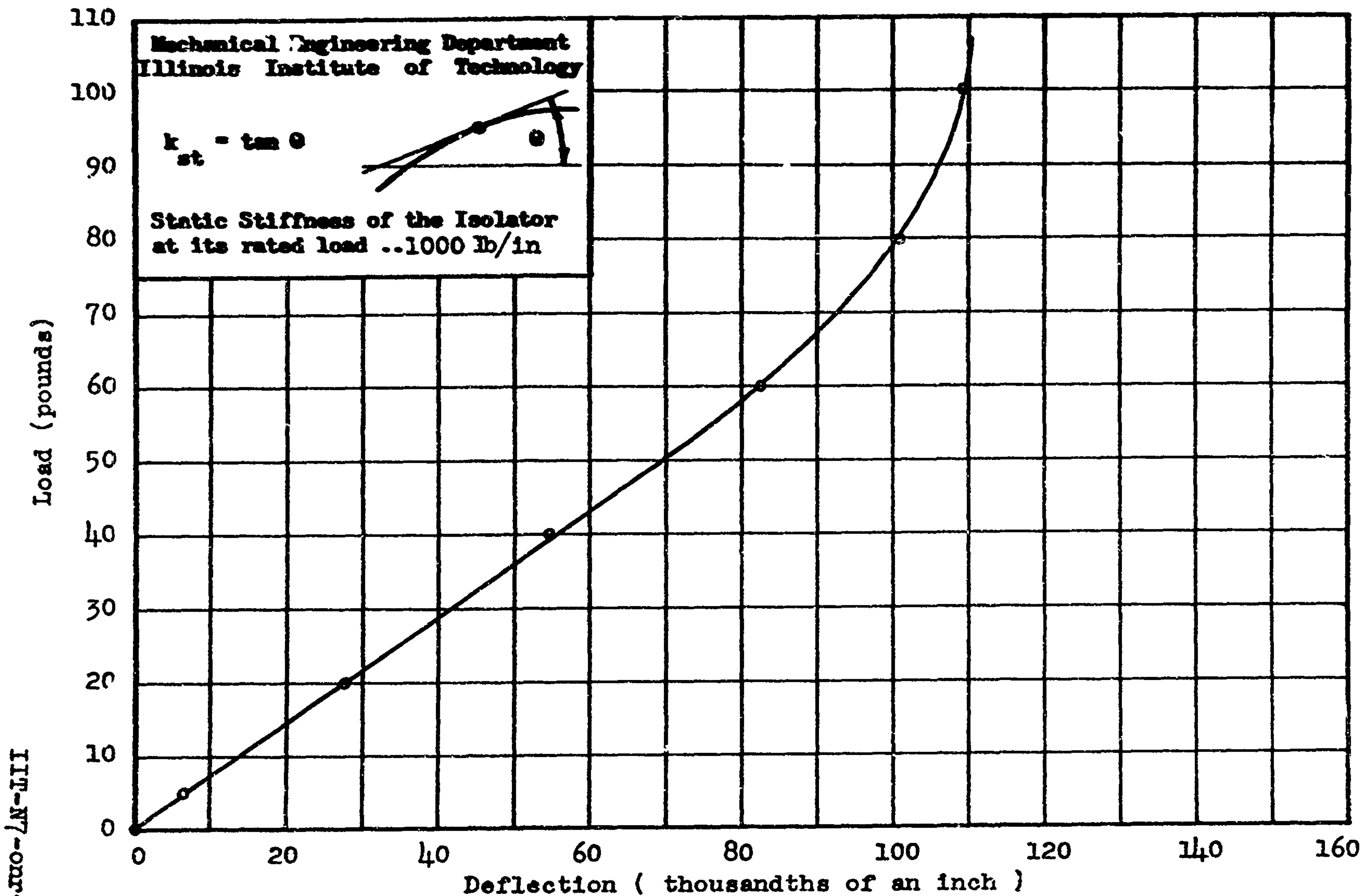
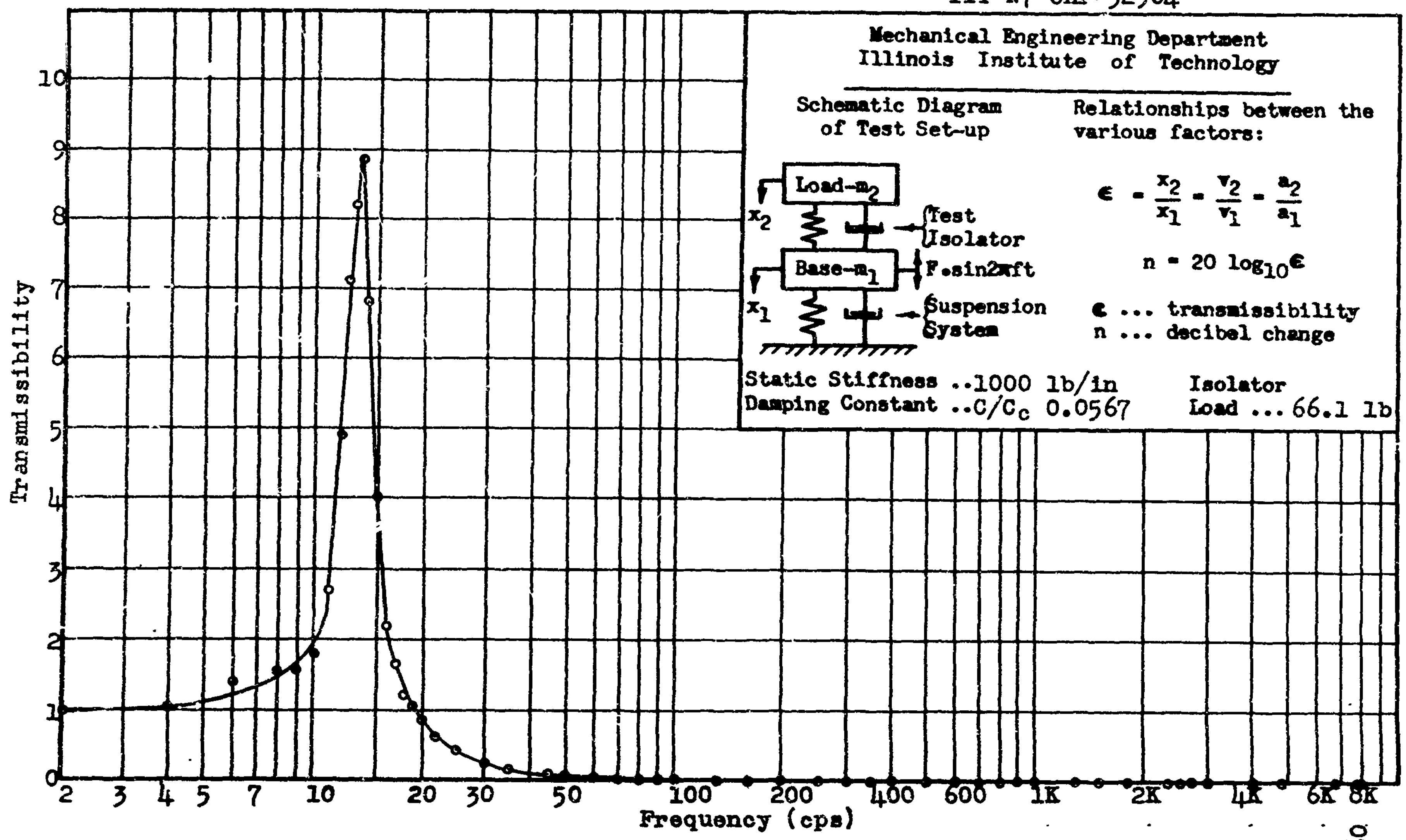


PLATE VI-7



Load-Deflection Curve - MB 1738.3

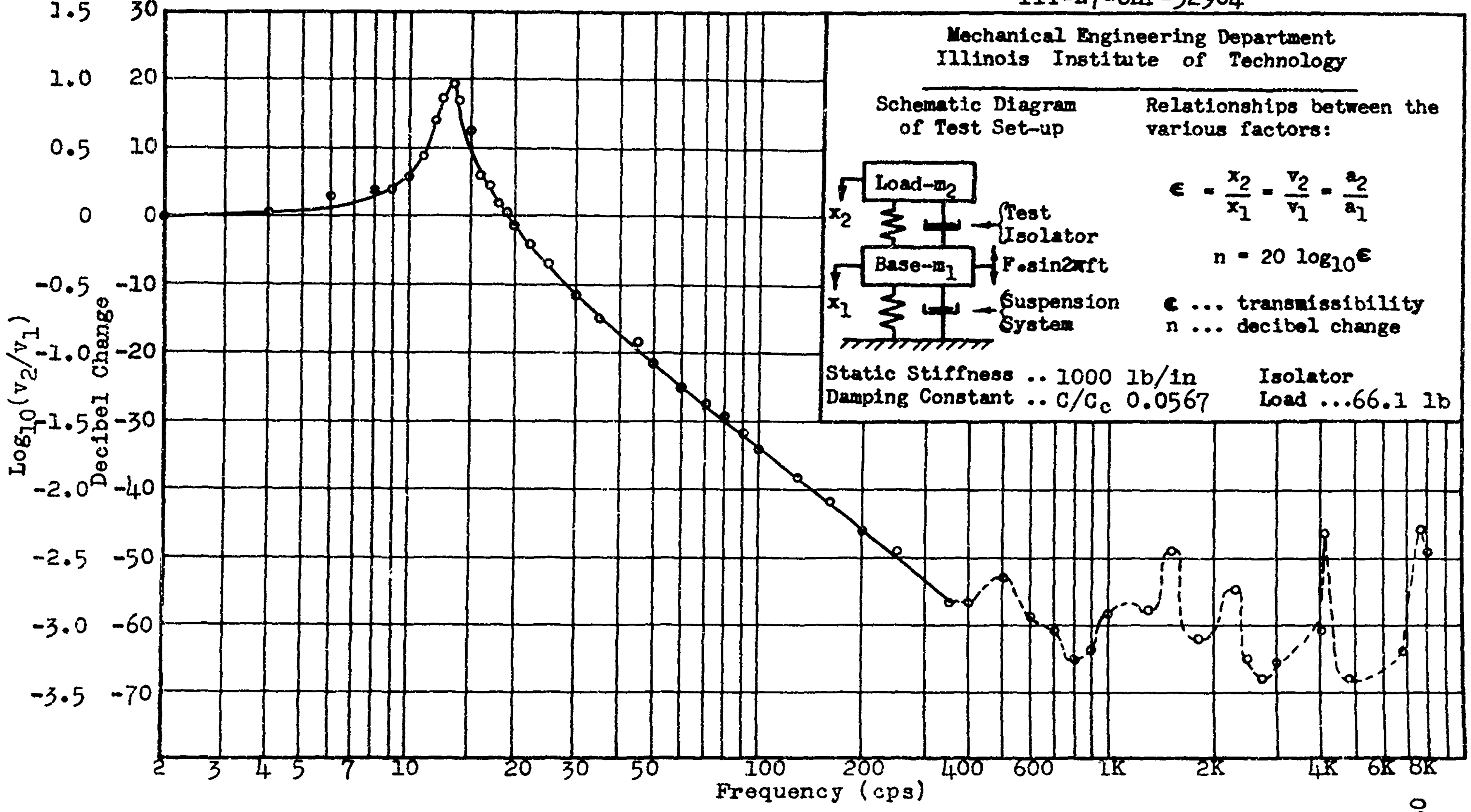
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - 1738.3

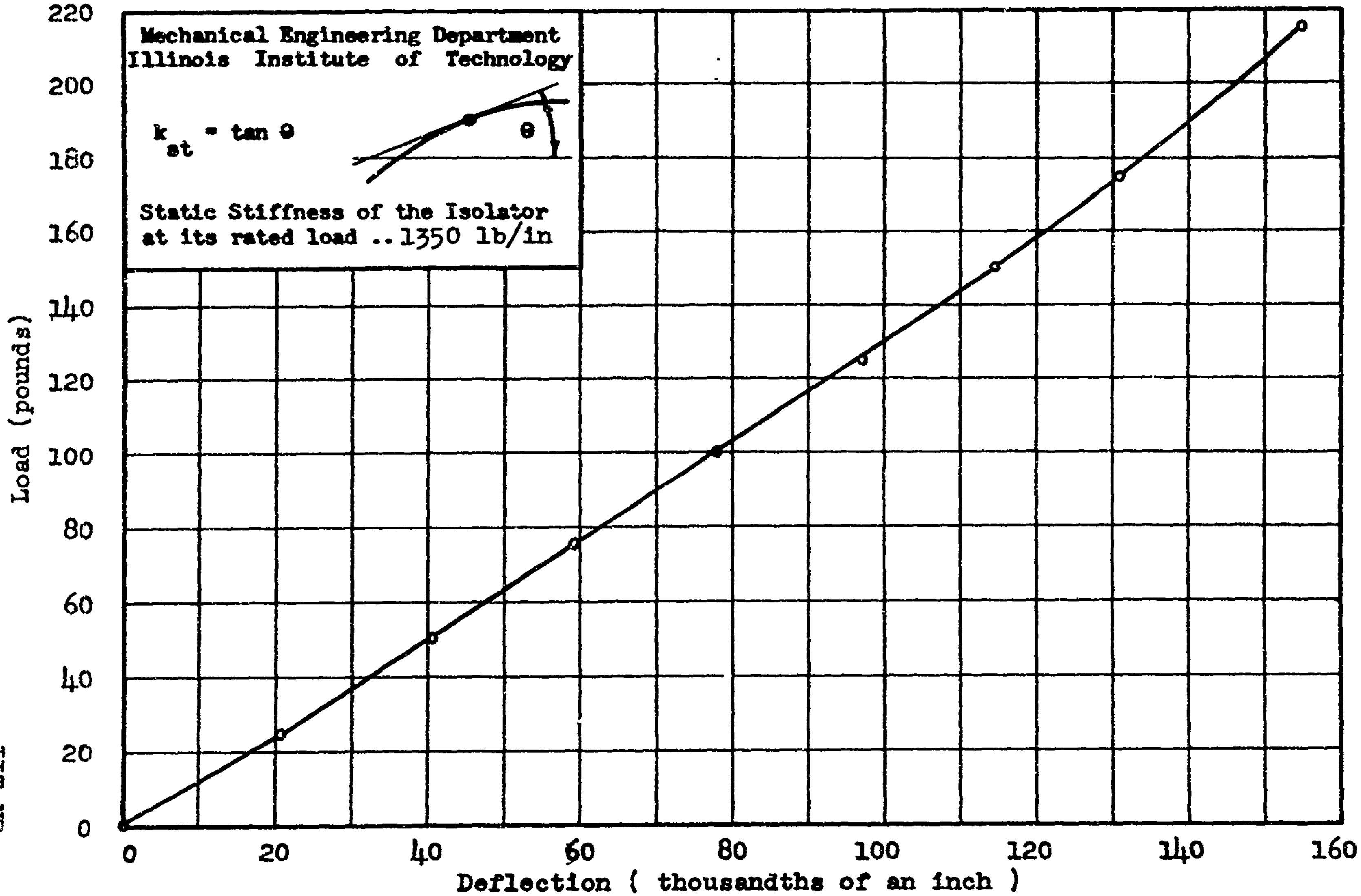
091M-b

IIT-N7-onr-32904

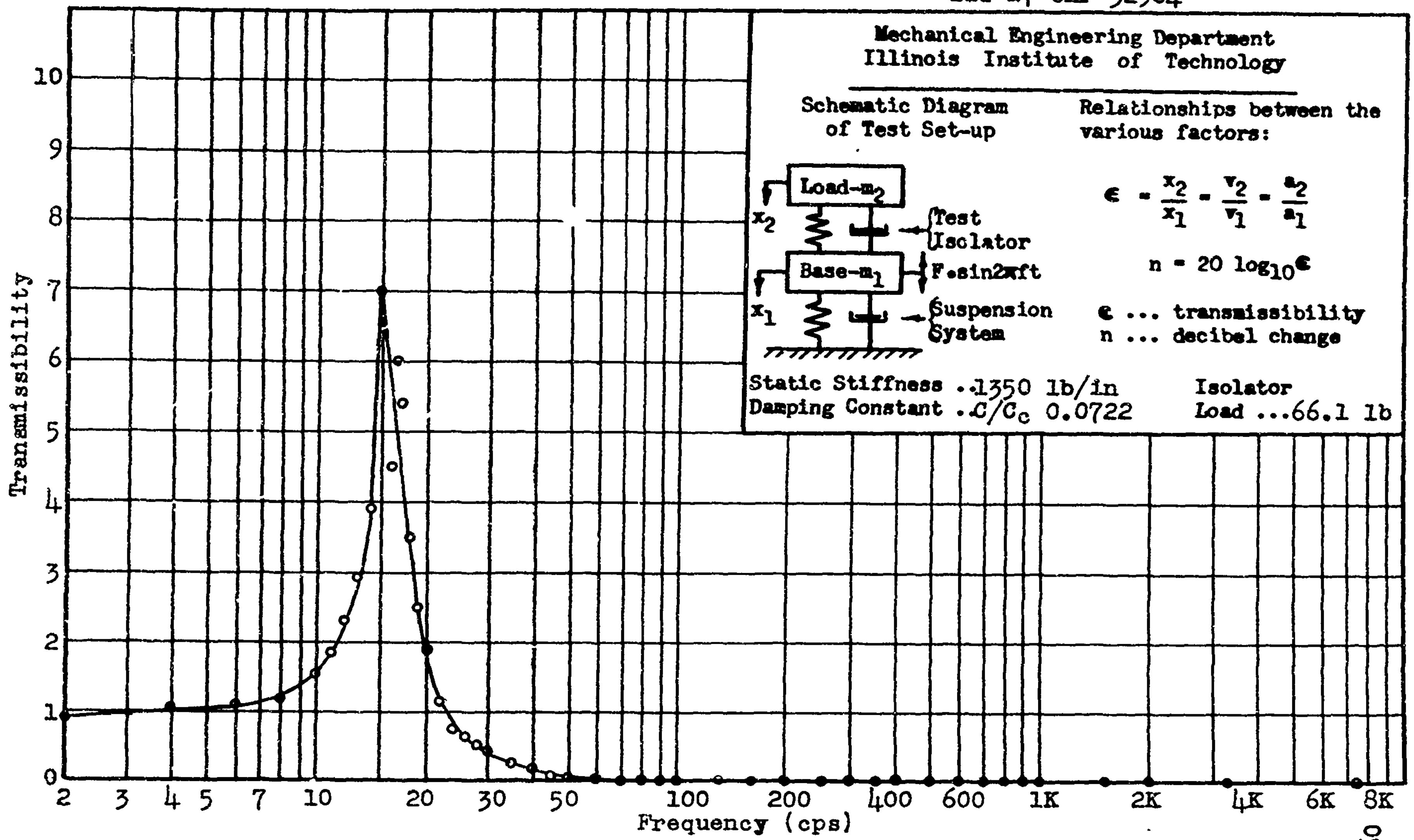


$\log_{10}(v_2/v_1)$ vs Frequency Curve - MB 1738.3

091M-c



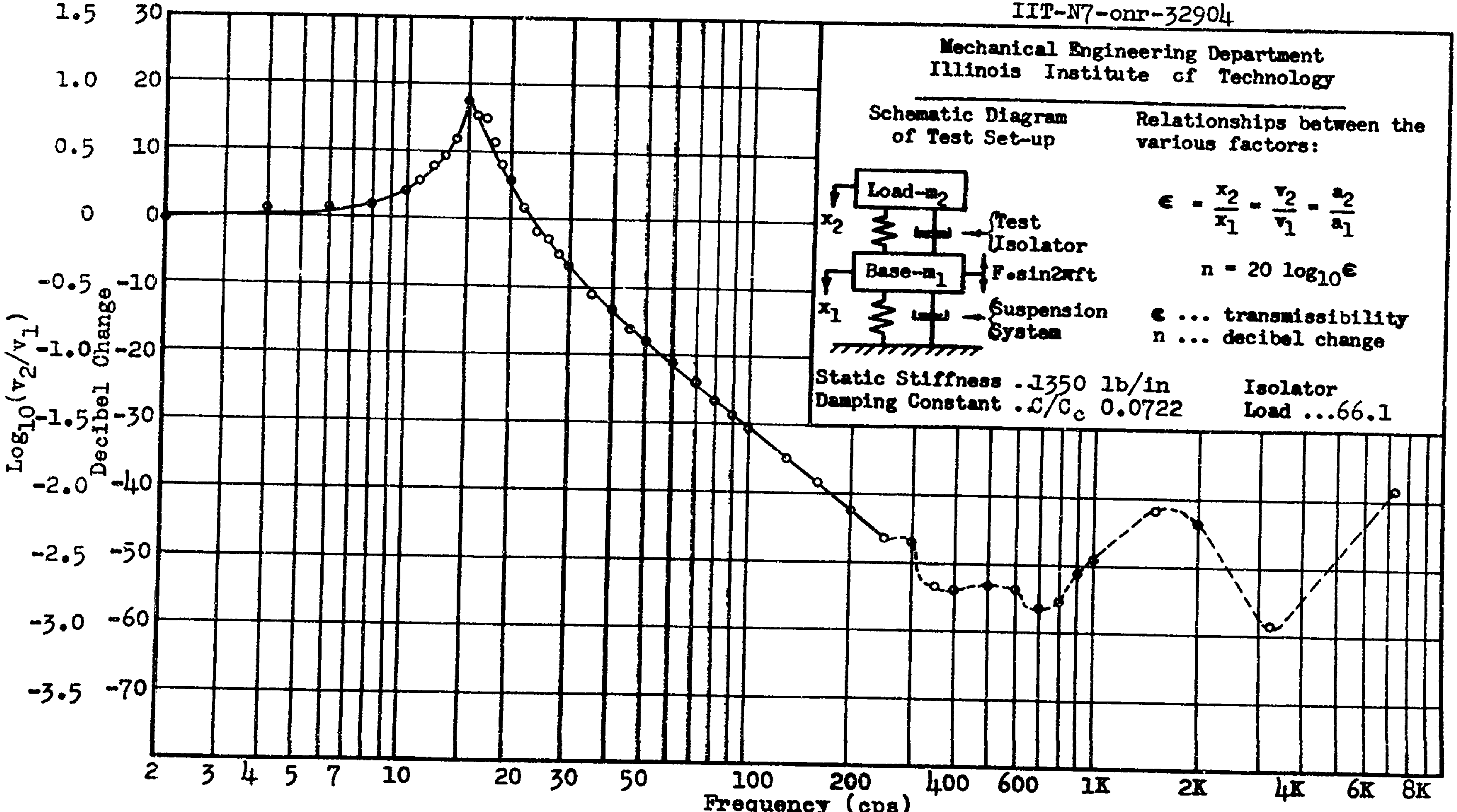
Load-Deflection Curve - MB 507 C 12



Transmissibility vs Frequency Curve - MB 507 C 12

092M-b

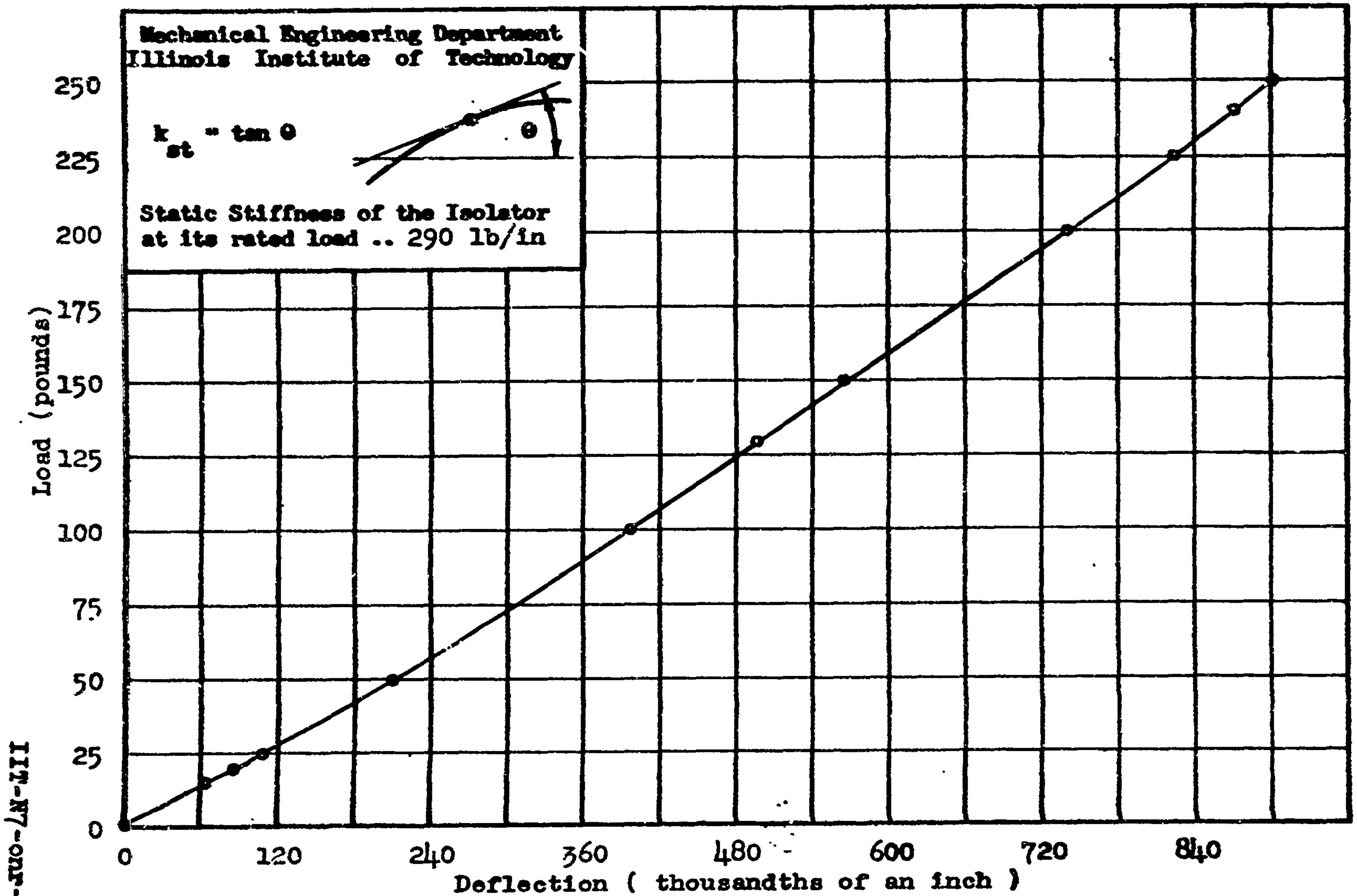
IIT-N7-onr-32904



$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - MB 507 C 12

092M-c

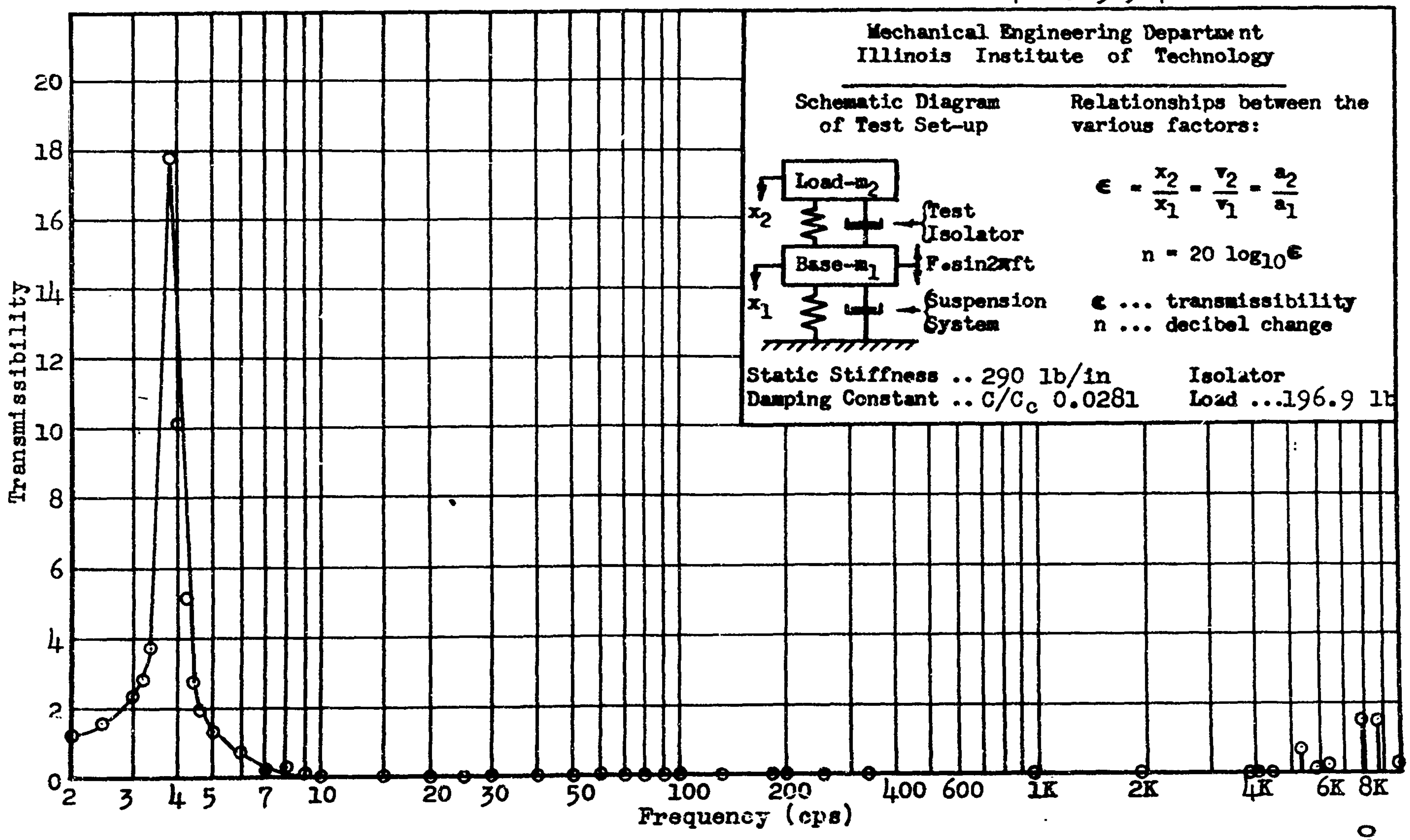
093B-a



Load-Deflection Curve - Barry 712-25

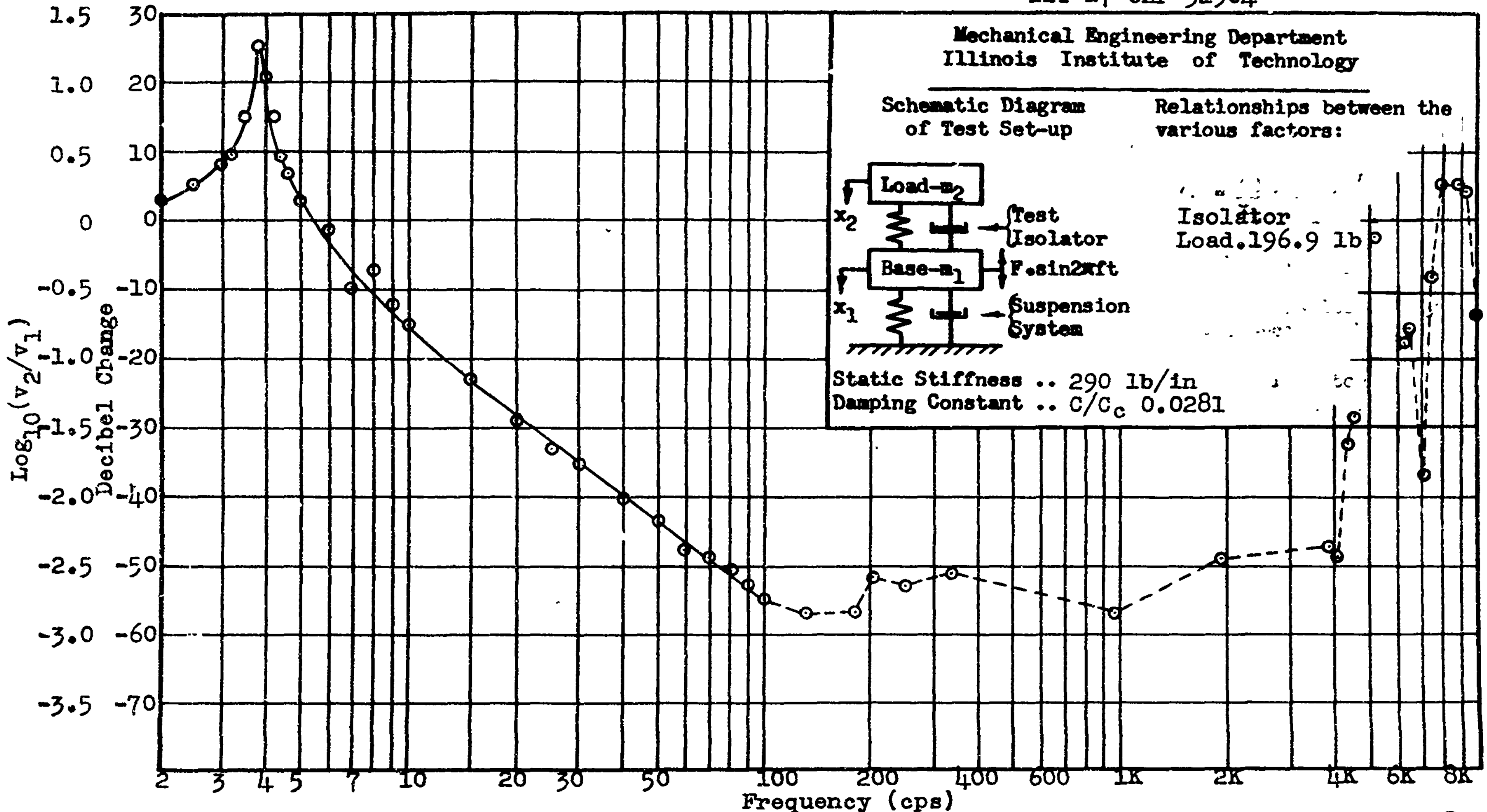
IIT-N7-onr-32904

IIT-N7-onr-32904



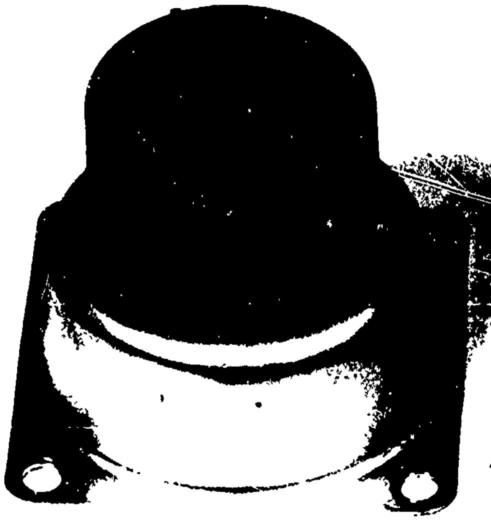
Transmissibility vs Frequency Curve - Barry 712-25

093B-b



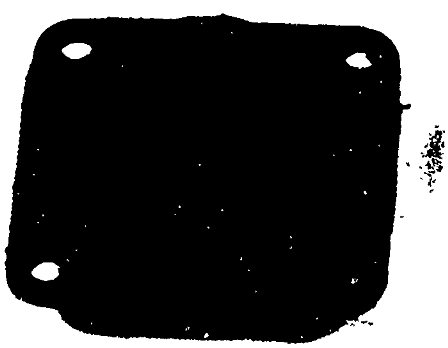
$Log_{10}(v_2/v_1)$ vs Frequency Curve - Barry 712-25

093B-c

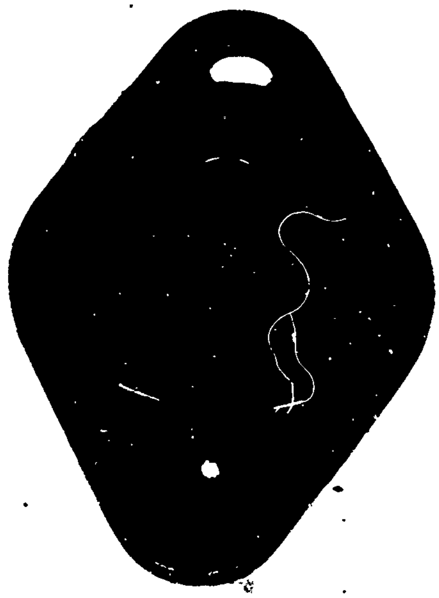


LORD 200XPH-60
094 L

LORD 204PH-60
095 L

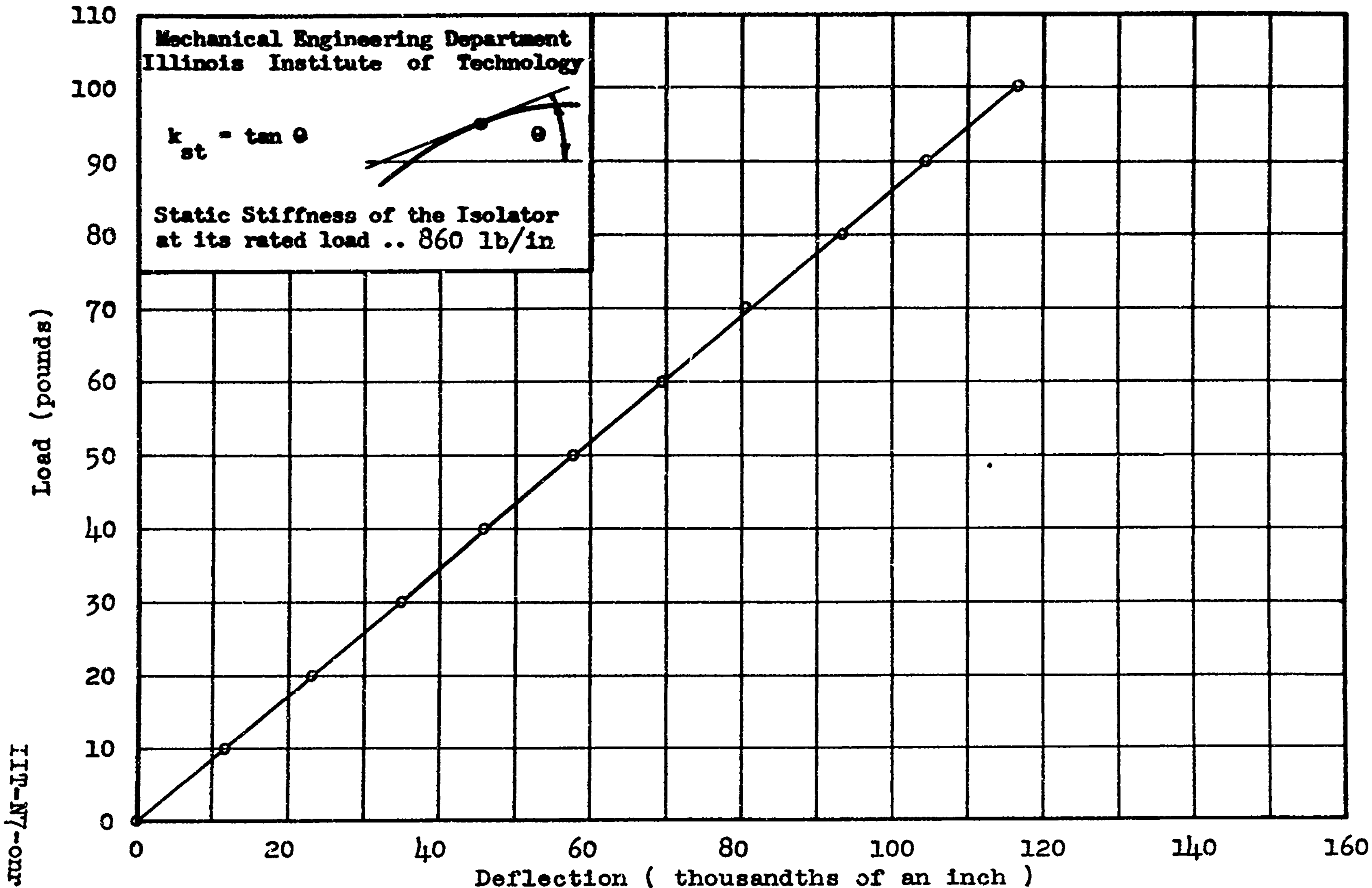


MB 17310
097M

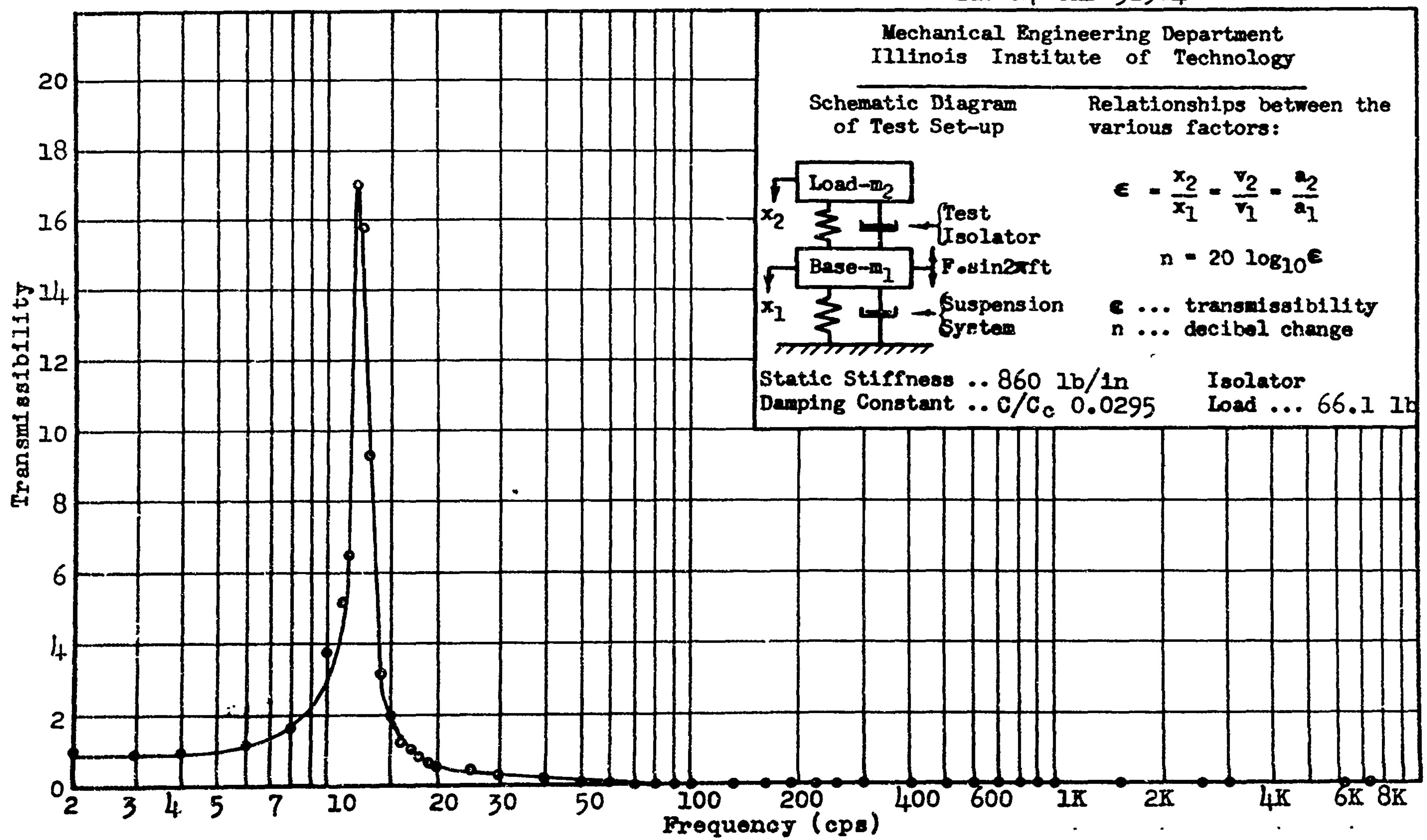


MB 507-C-10
098 M

PLATE VI-8

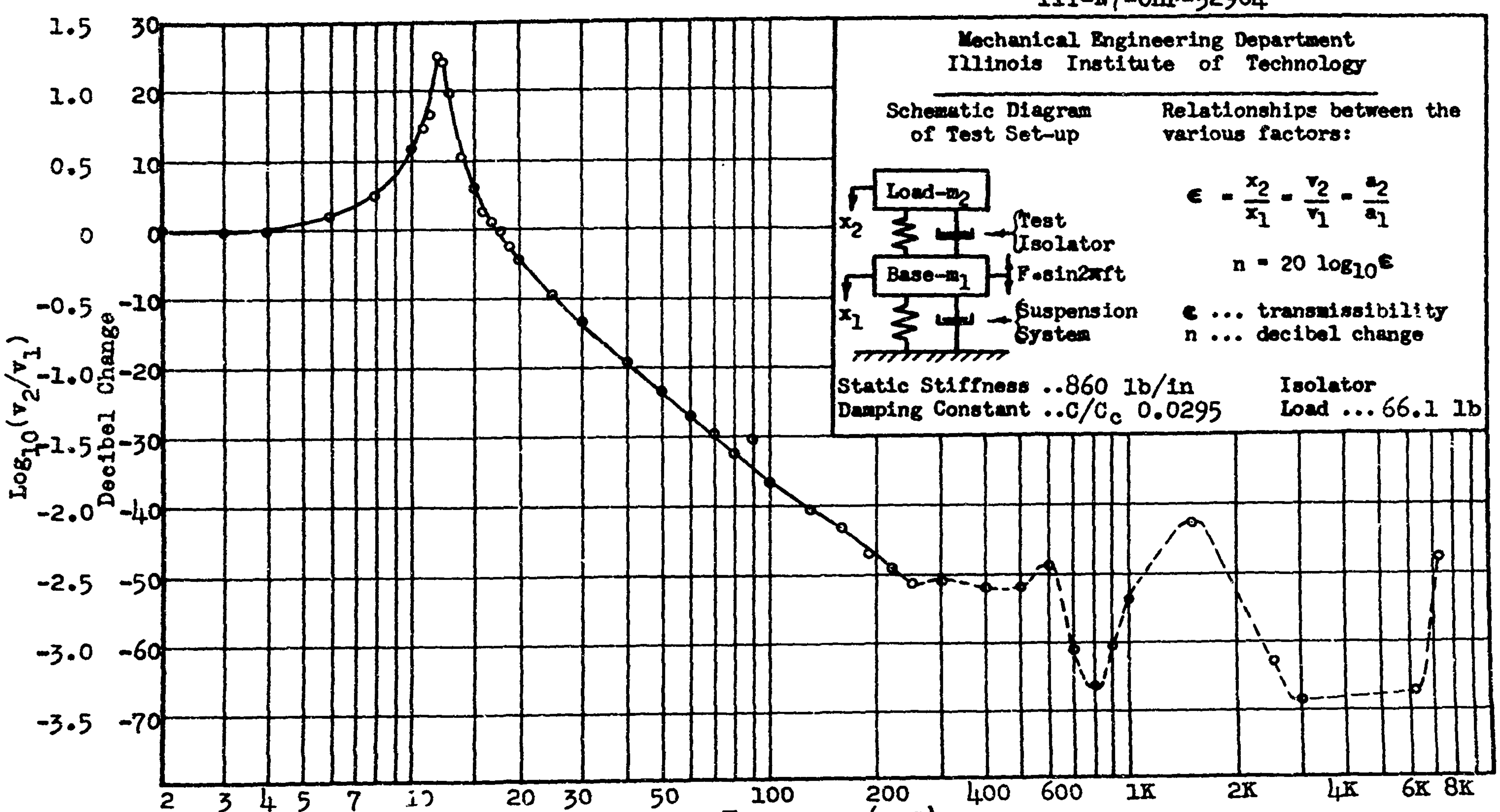


Load-Deflection Curve - Lord 200 XPH 60



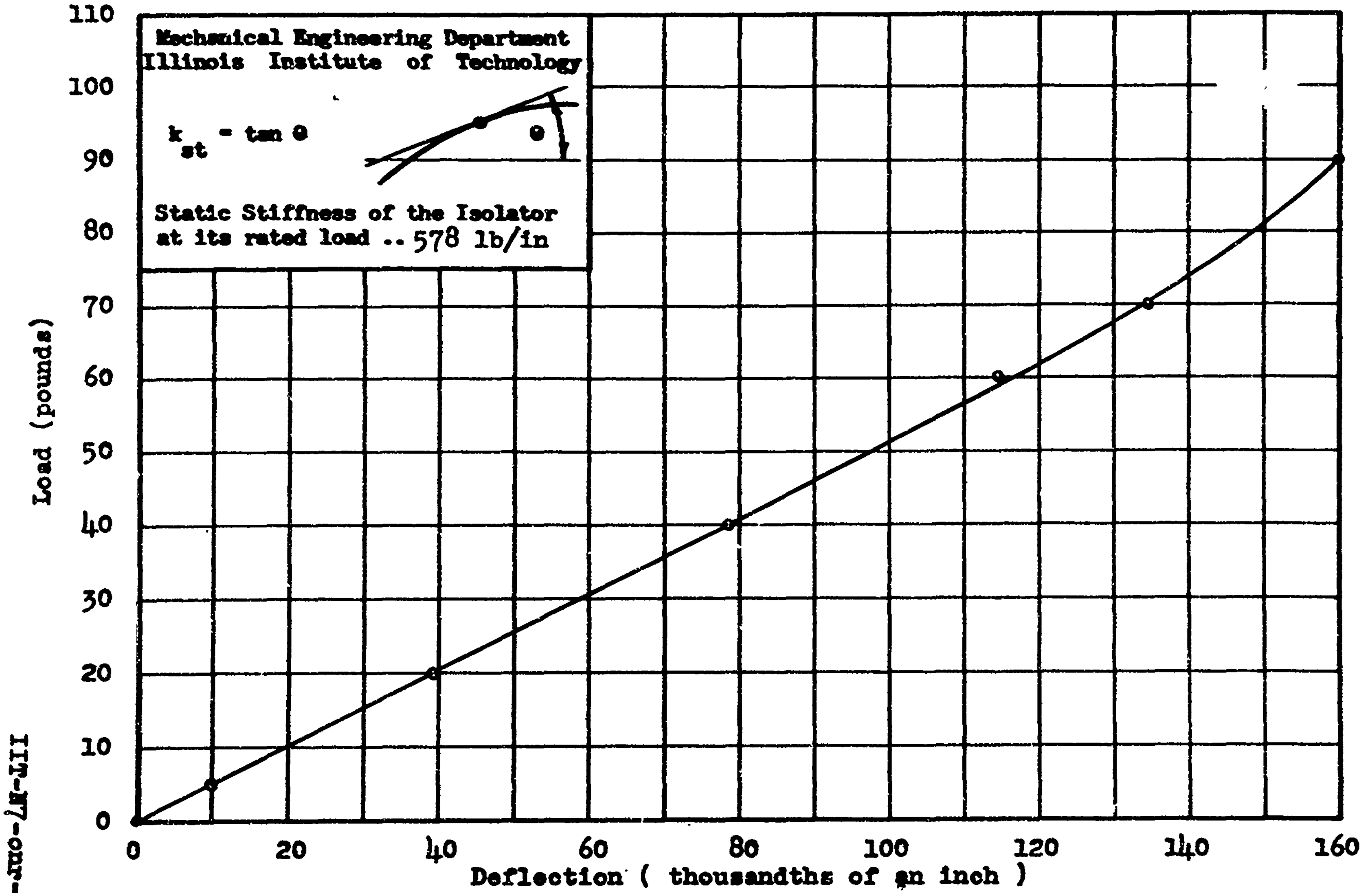
Transmissibility vs Frequency Curve - Lord 200 XPH 60

a-1760



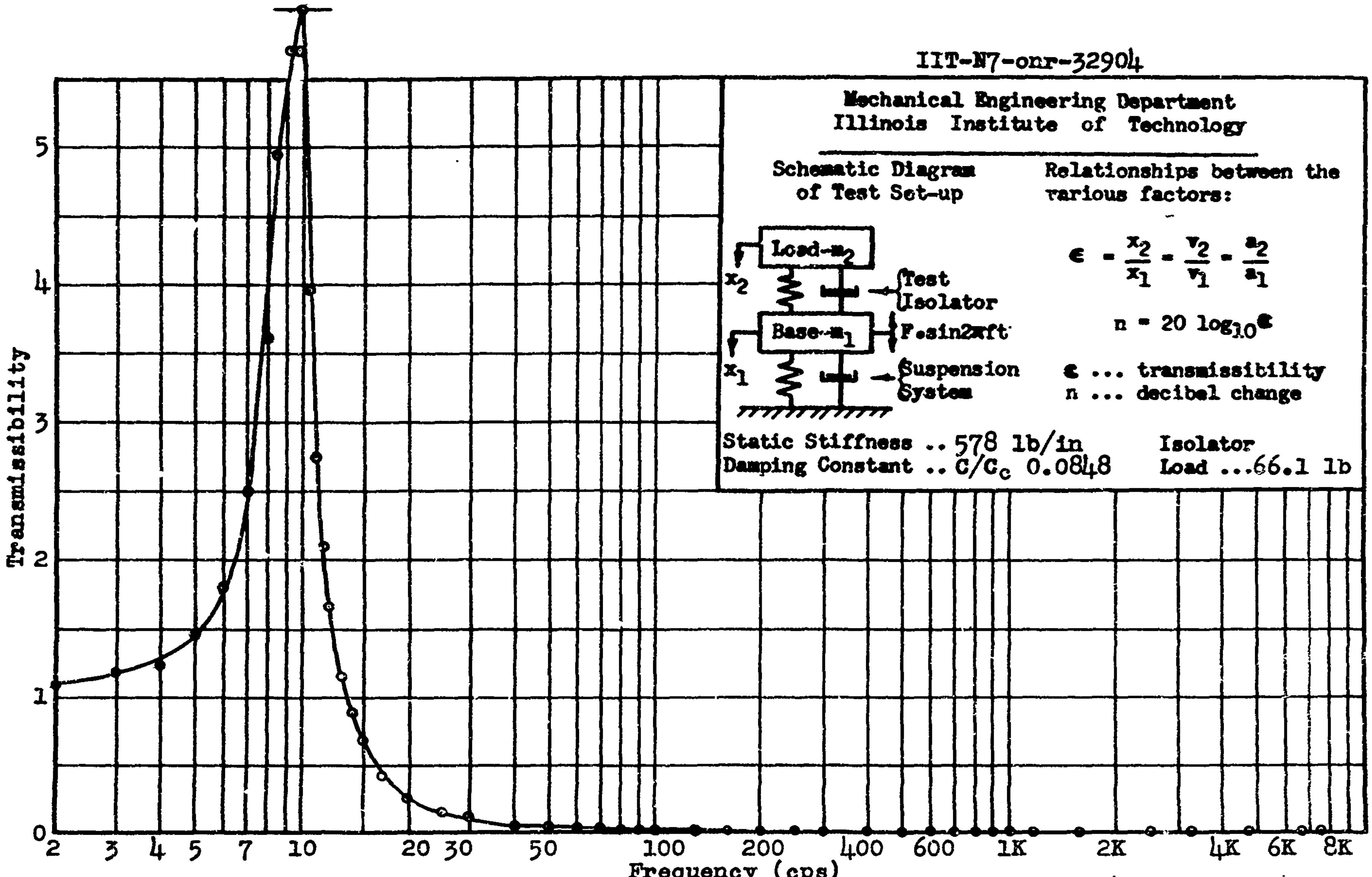
$\log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 200 XPH 60

c-1160



Load-Deflection Curve - Lord 204 PH 60

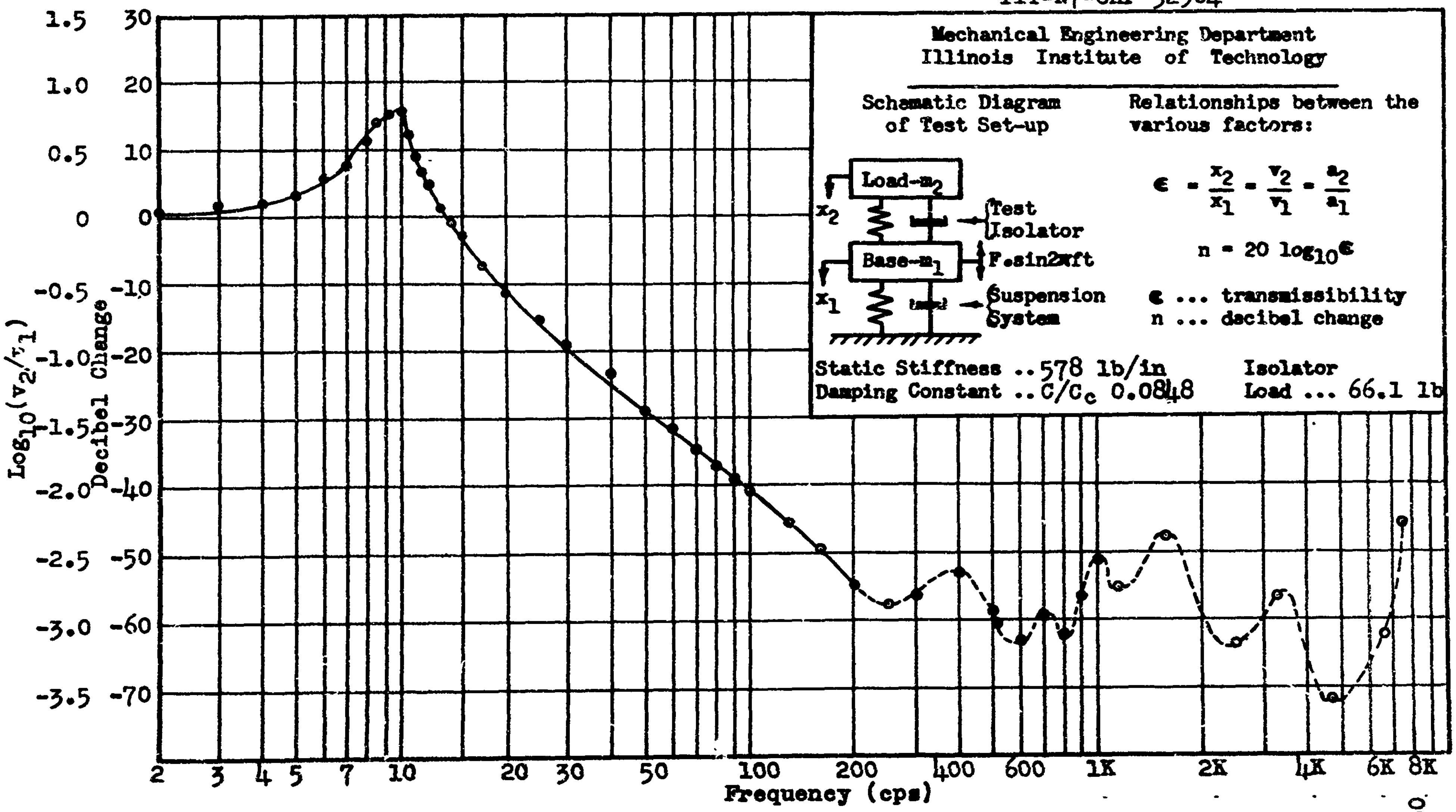
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Lord 204 PH 60

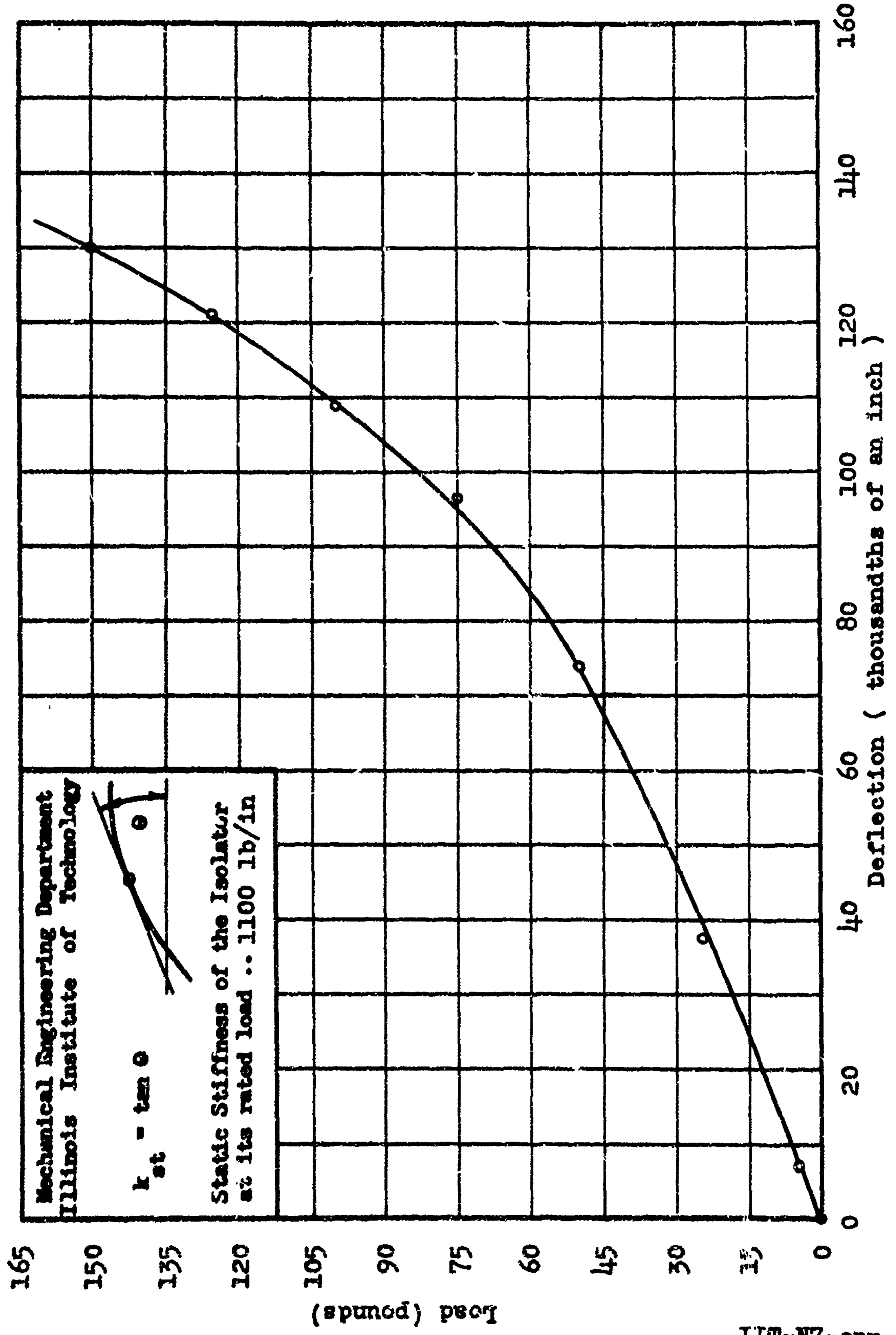
095L-b

IIT-N7-onr-32904



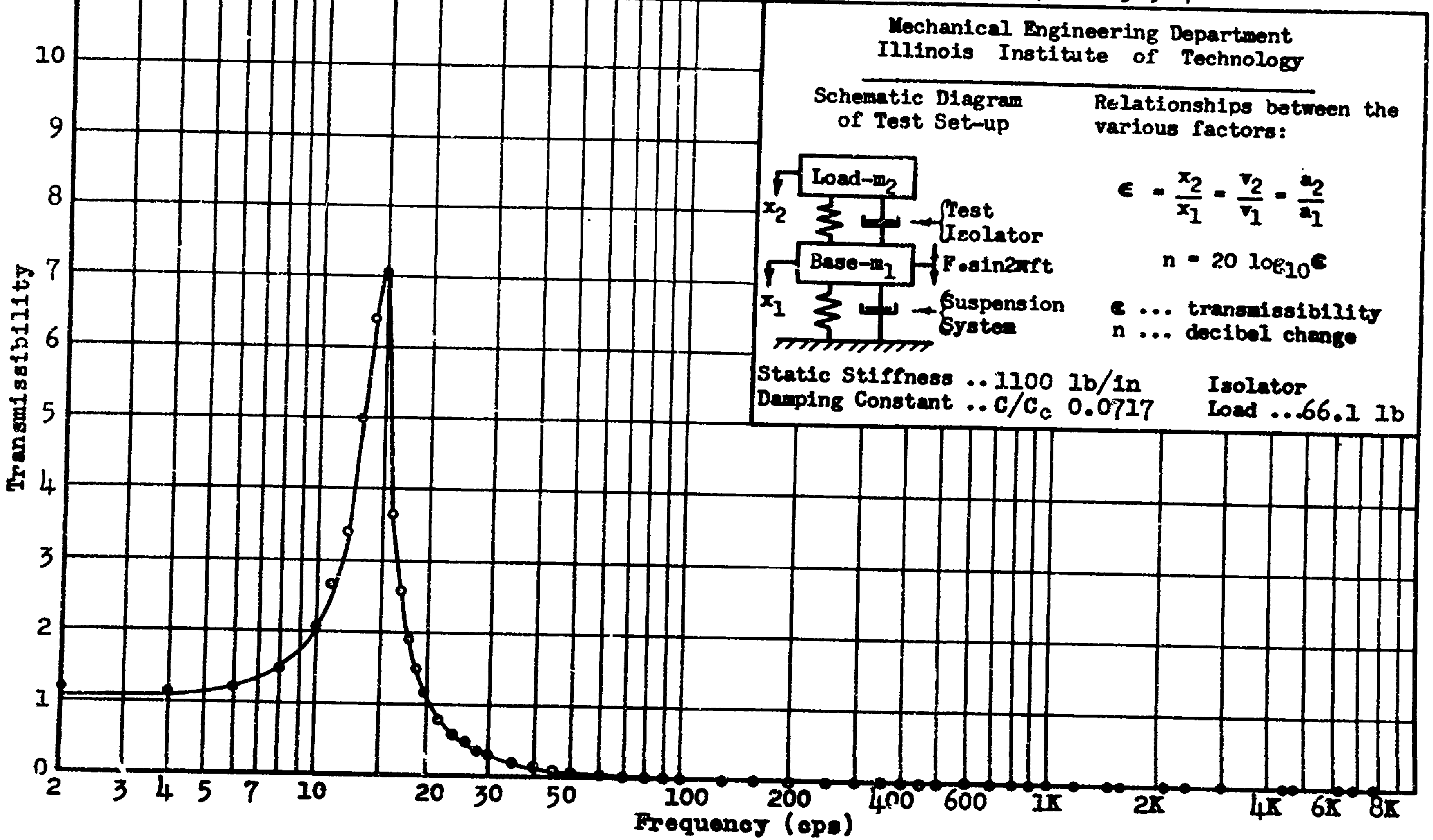
$Log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 204 PH 60

095L-c



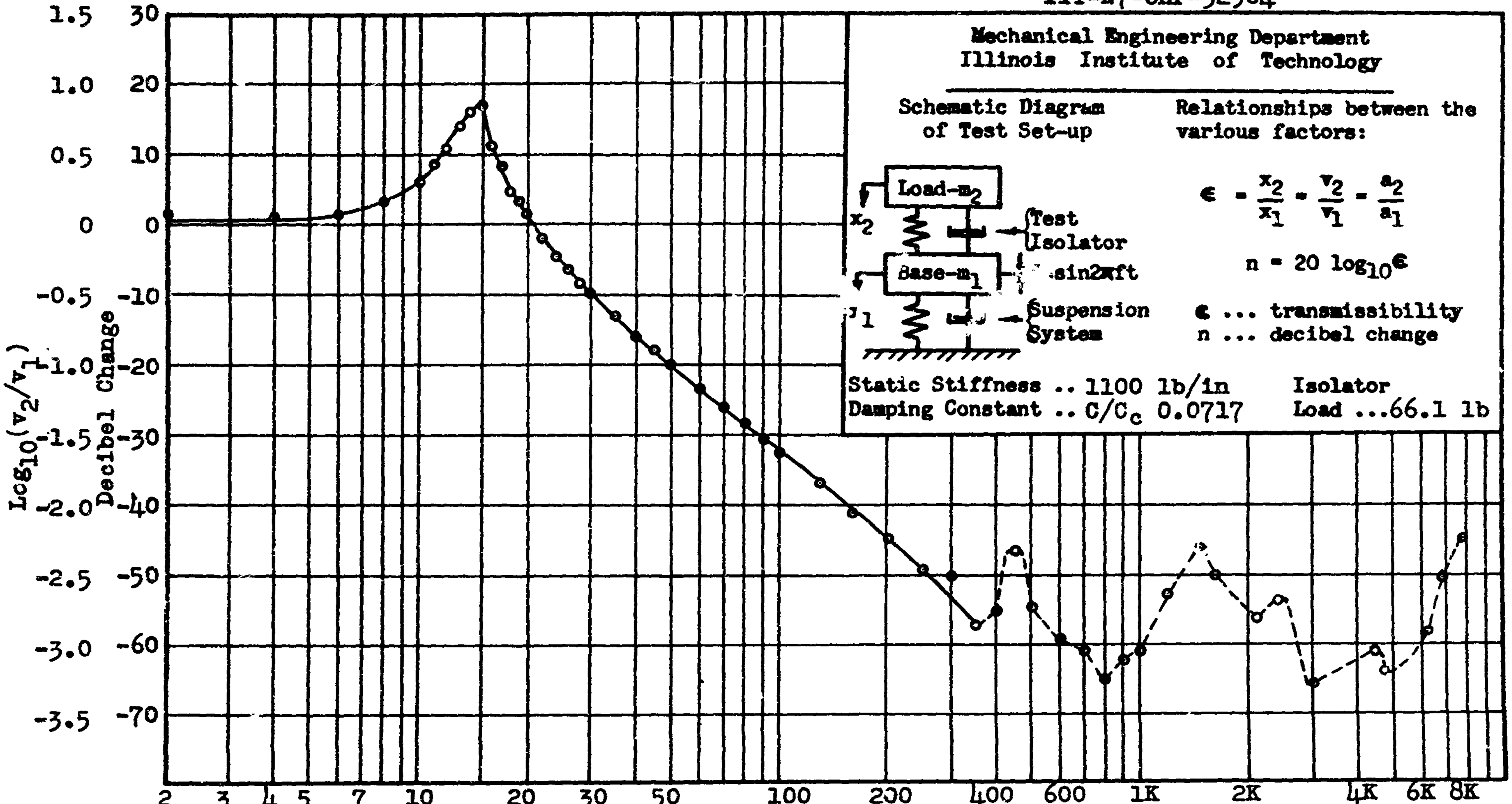
Load-Deflection Curve - MB 17310

IIT-N7-onr-32904



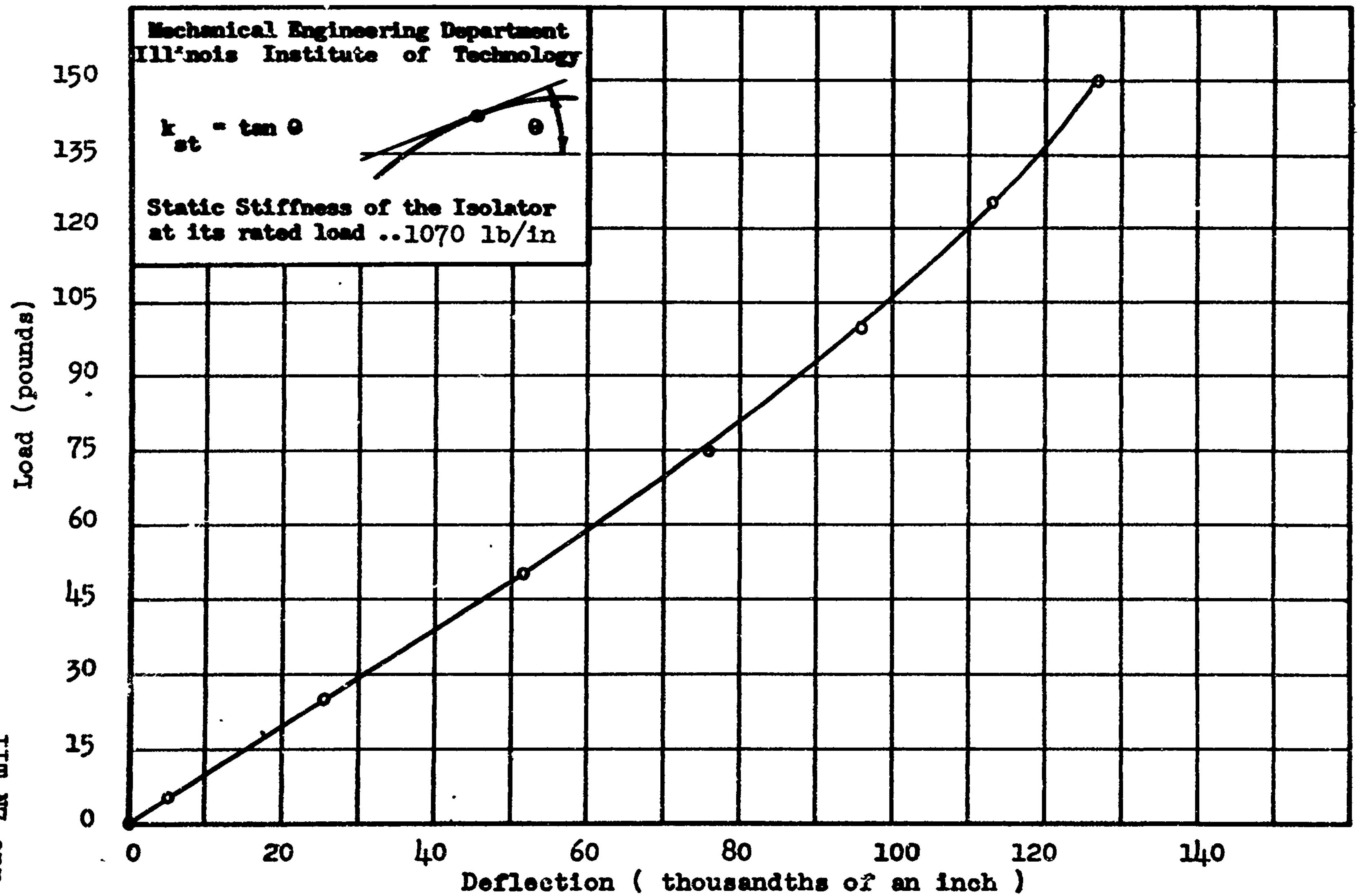
Transmissibility vs Frequency Curve - MB 17310

097M-b

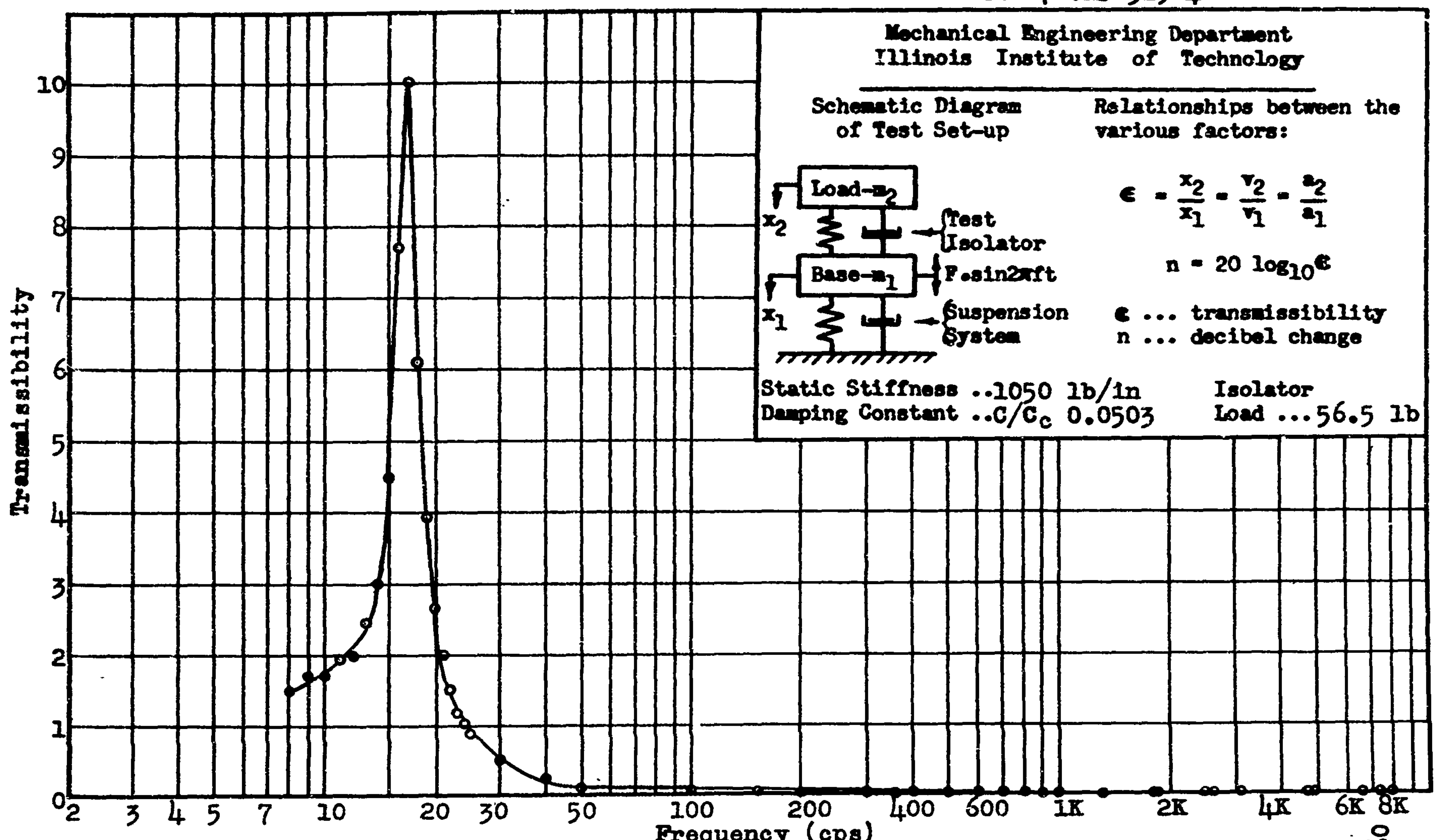


$\mathrm{Log}_{10}(v_2/v_1)$ vs Frequency Curve - MB 17310

097M-c

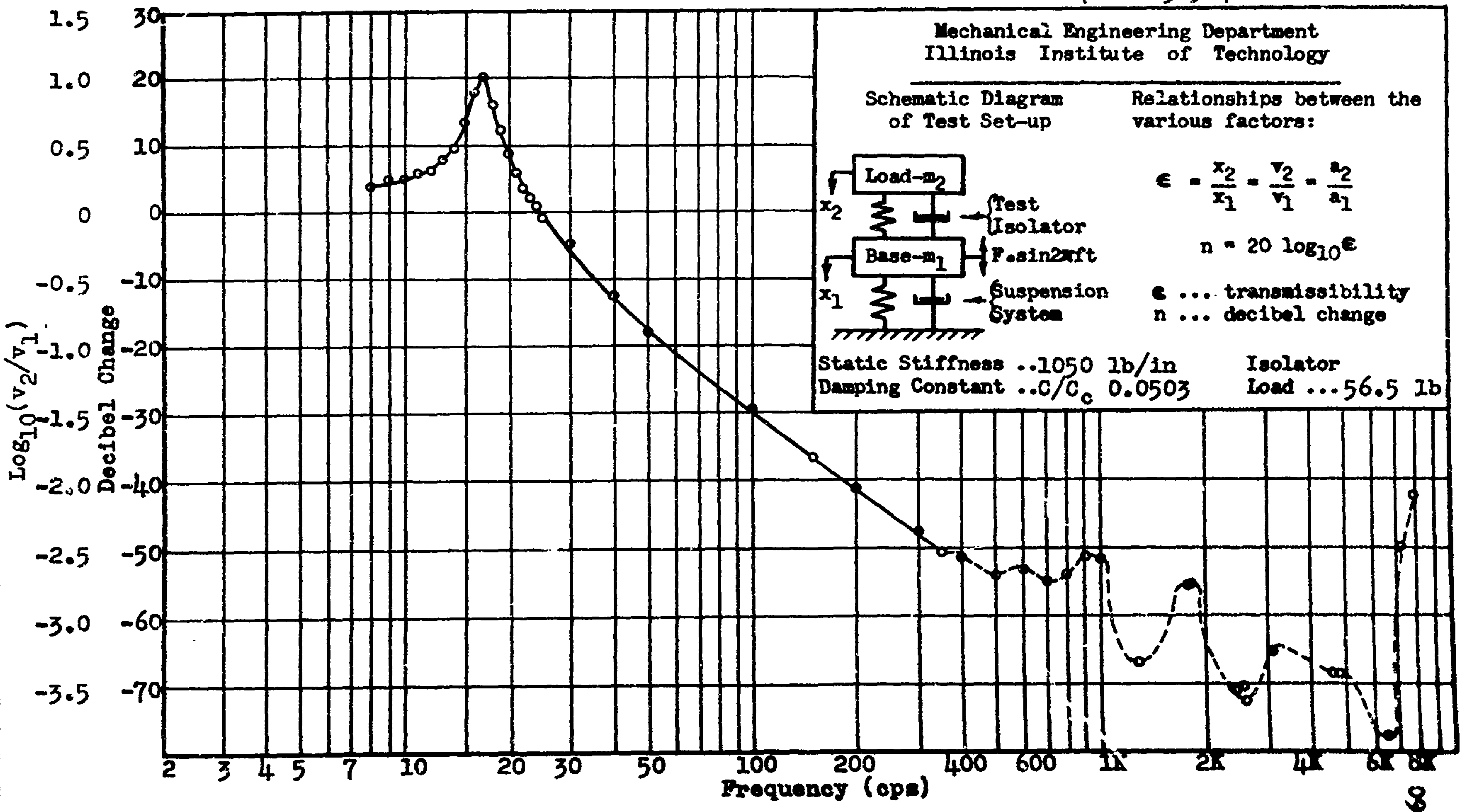


Load-Deflection Curve - MB 507 C 10



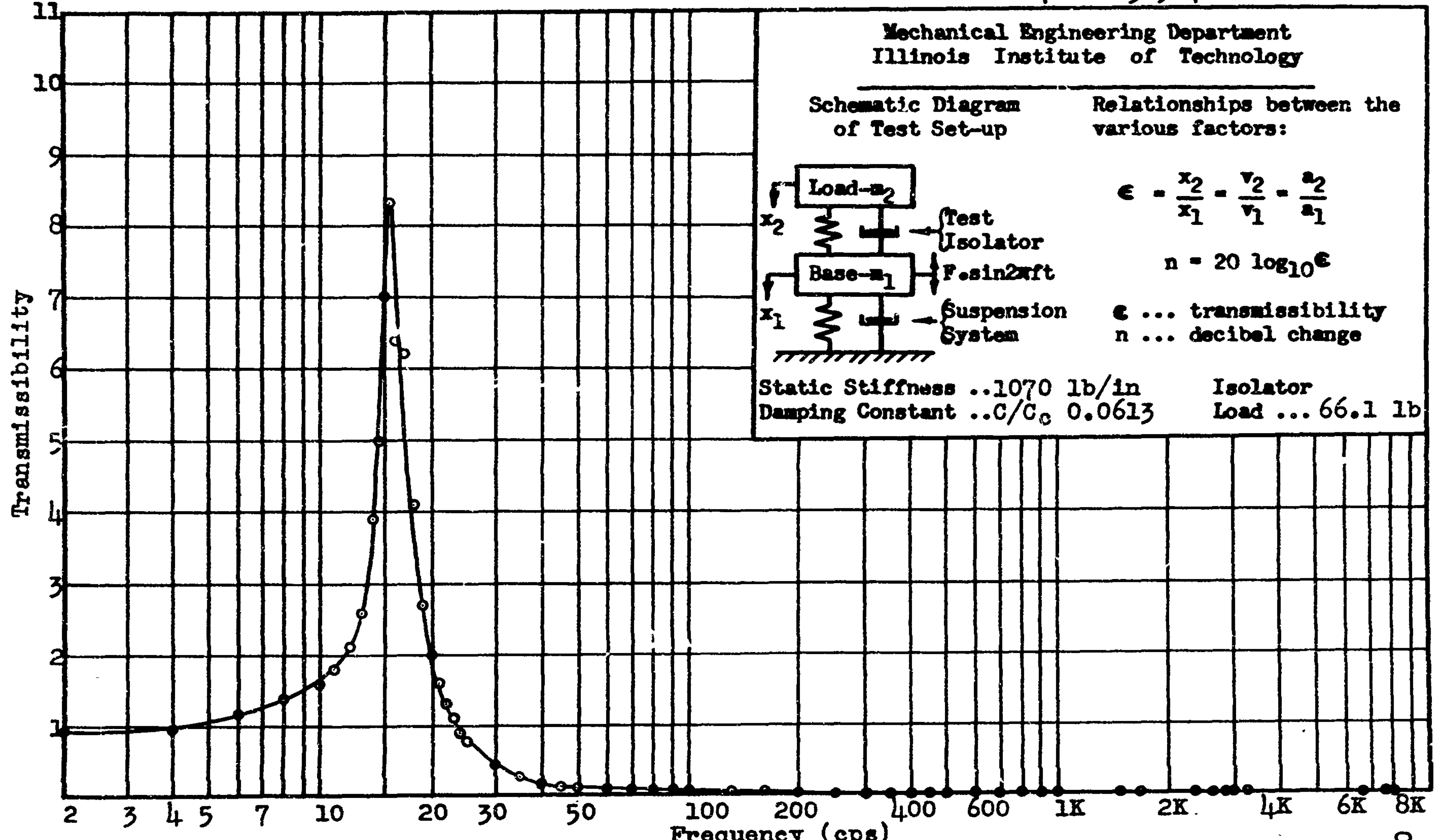
Transmissibility vs Frequency Curve - MB 507 C 10

098M-b



$\mathrm{Log}_{10}(v_1/v_2)$ vs Frequency Curve - MB 507 C 10

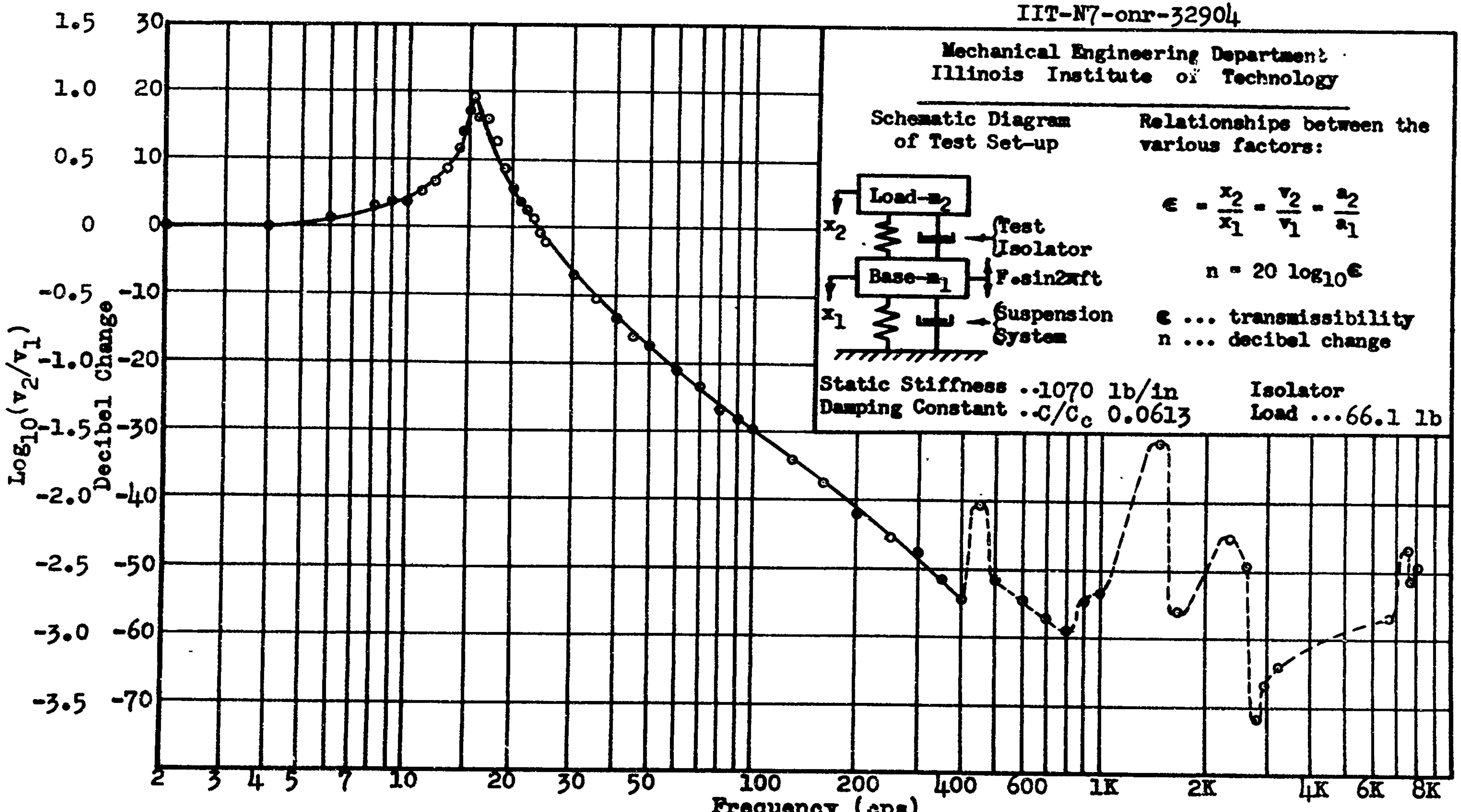
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - MB 507 C 10

098M-b

IIT-N7-onr-32904

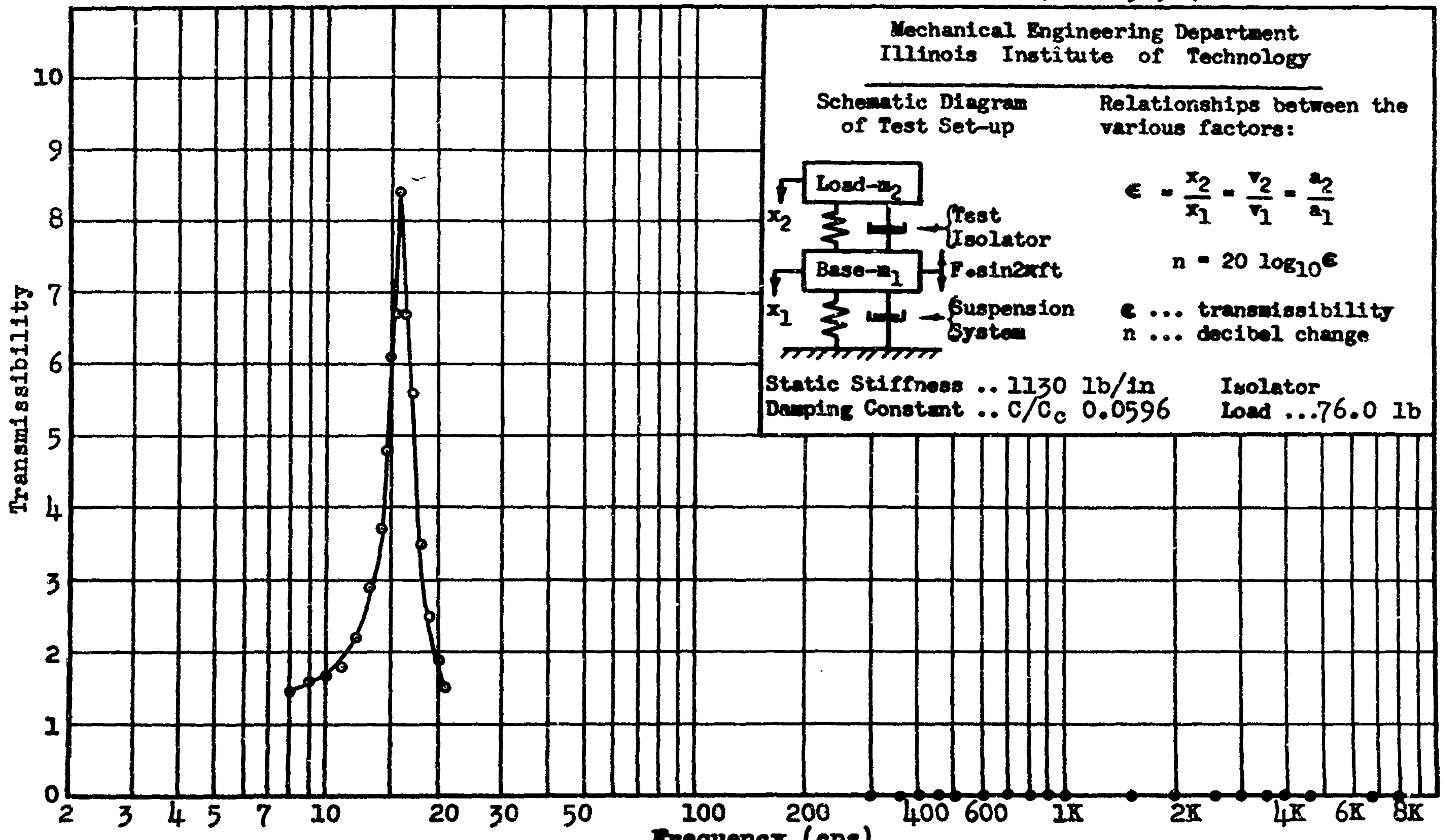


$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - MB 507 C 10

098M-c

NOTE:

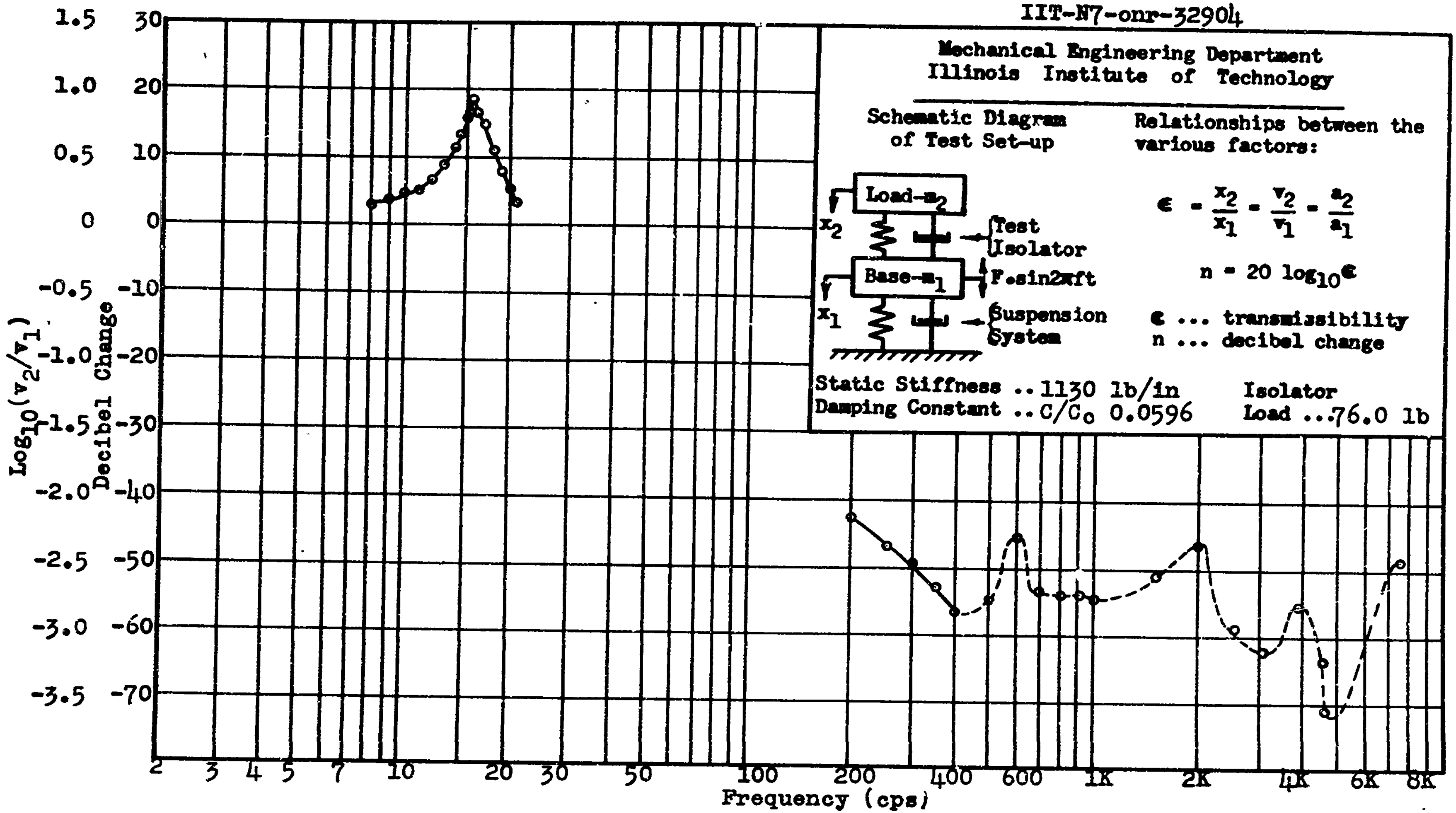
No data were taken at certain frequencies in the two curves that follow since it was desired to check only the resonant and high frequency regions.



Transmissibility vs Frequency Curve - MB 507 C 10

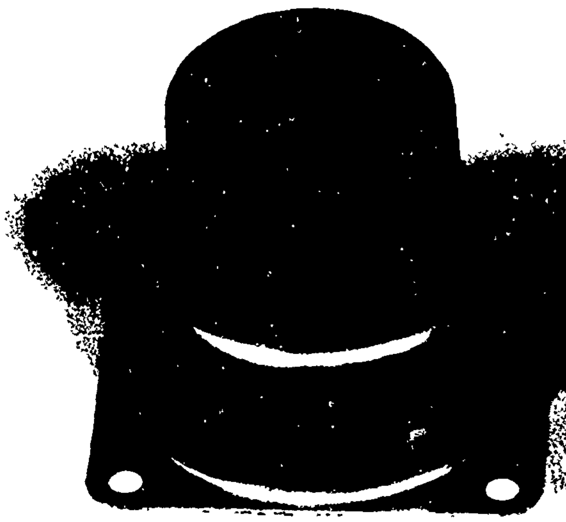
098M-b

IIT-N7-onr-32904

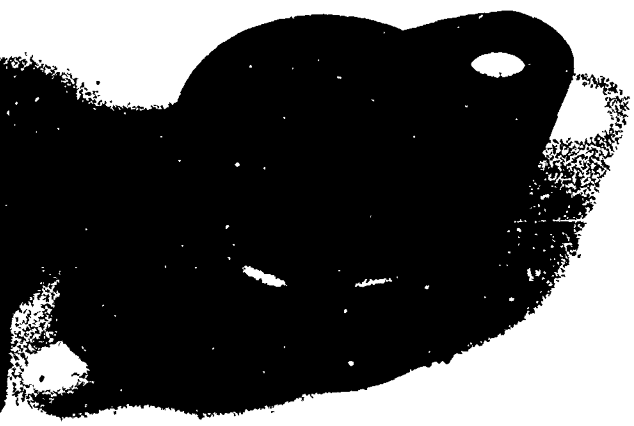


$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - MB 507 C 10

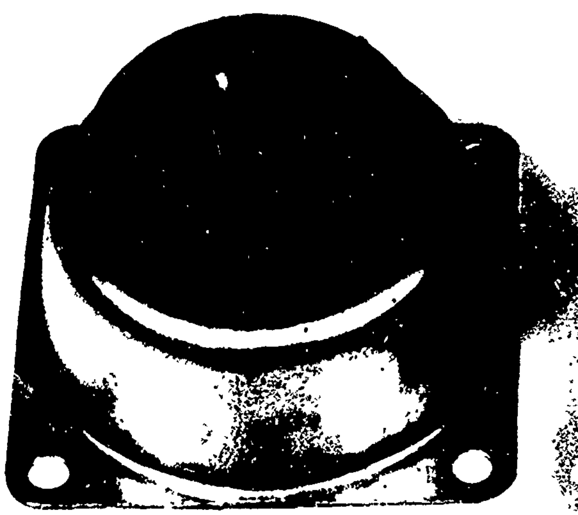
098M-c



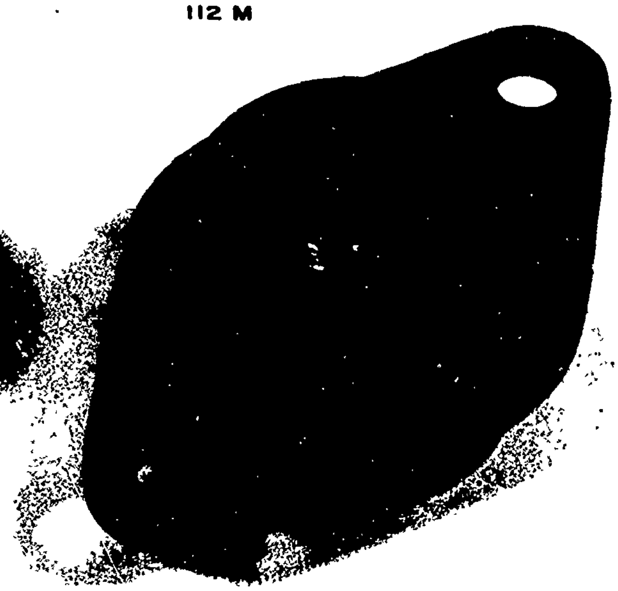
LORD 200XPH-75
111 L



MB 507-C-15
112 M

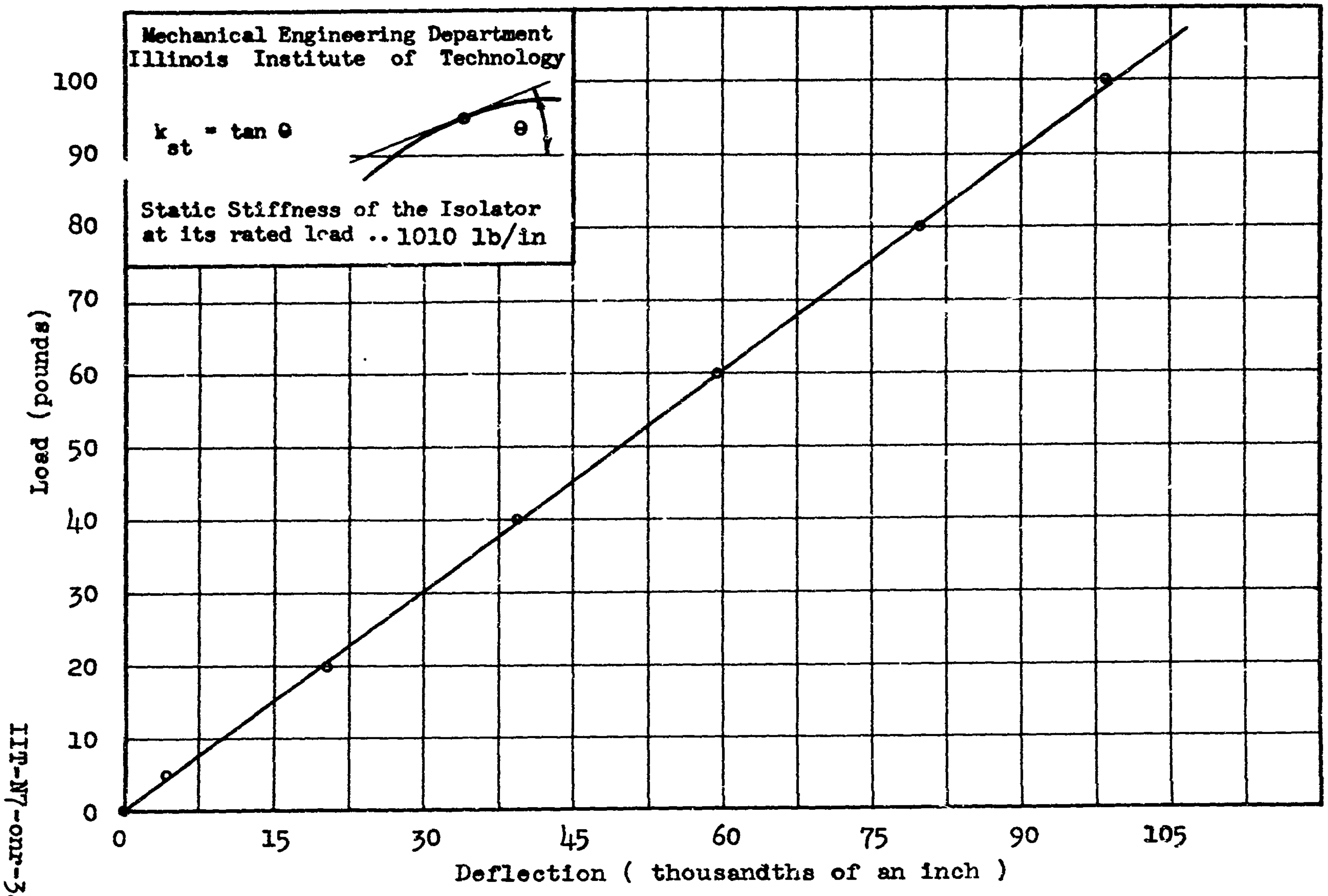


LORD 204PH-87
114 L

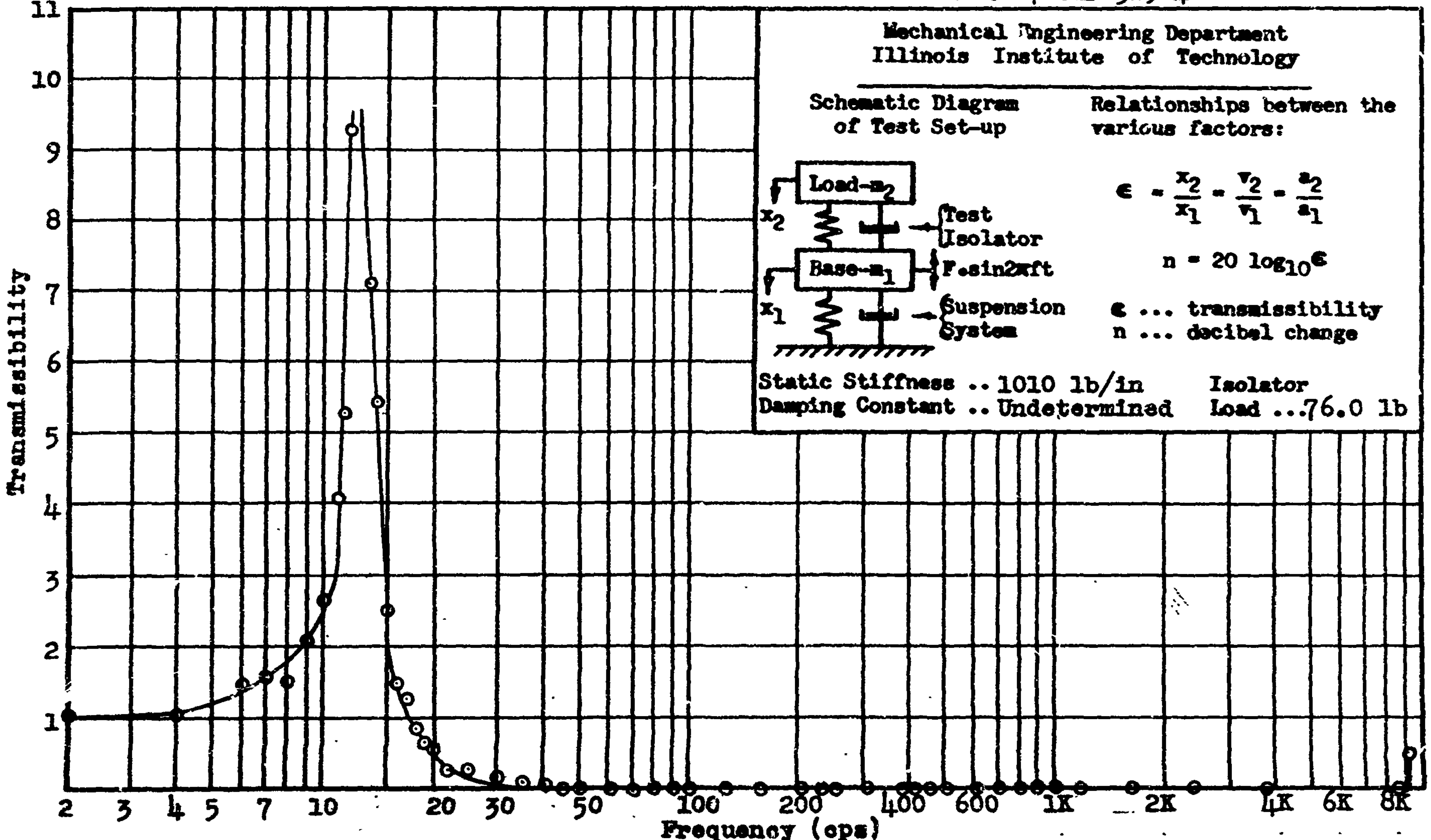


MB 508-C-18
115 M

PLATE VI-9

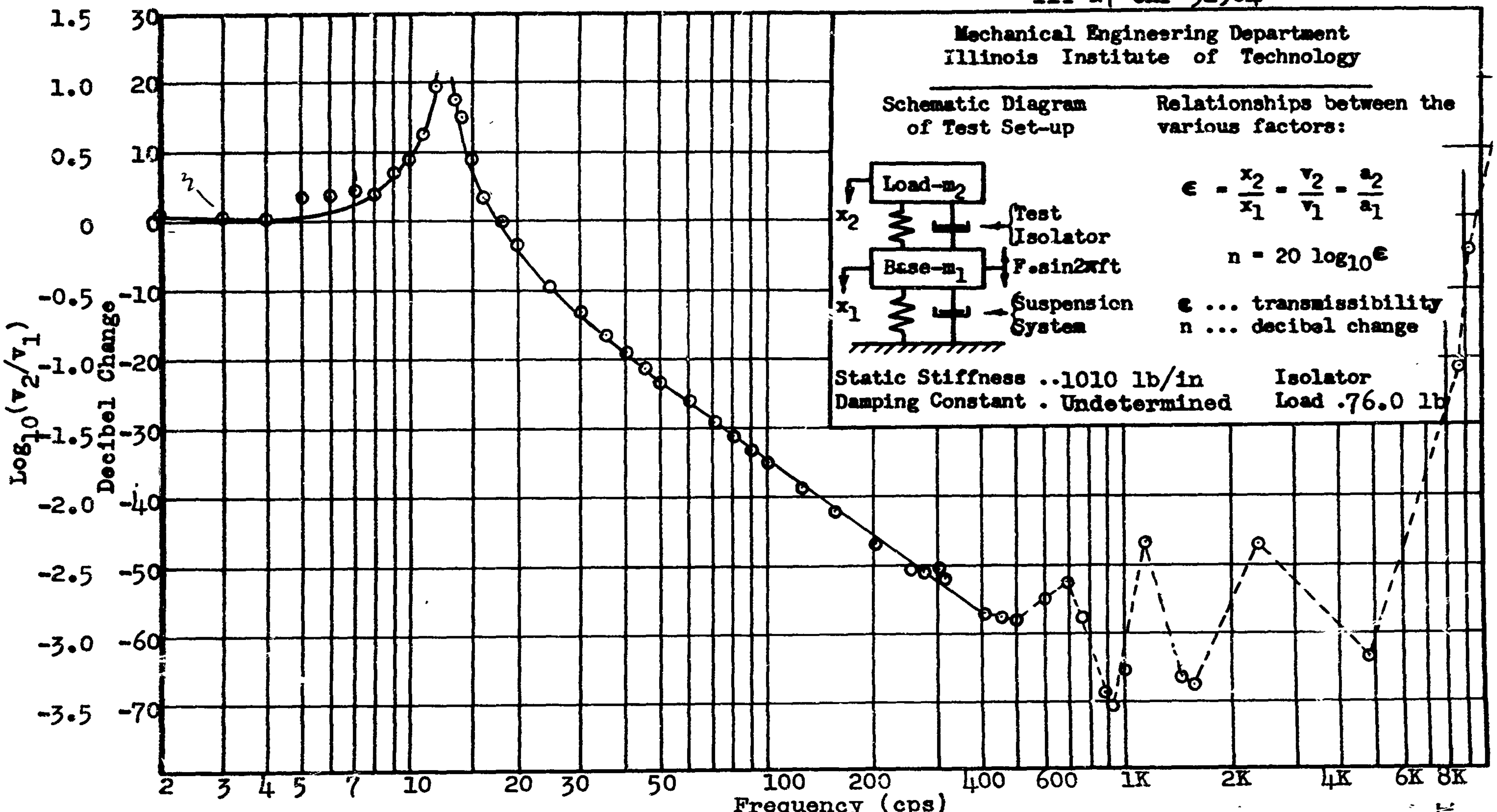


Load-Deflection Curve - Lord 200 XPH 75



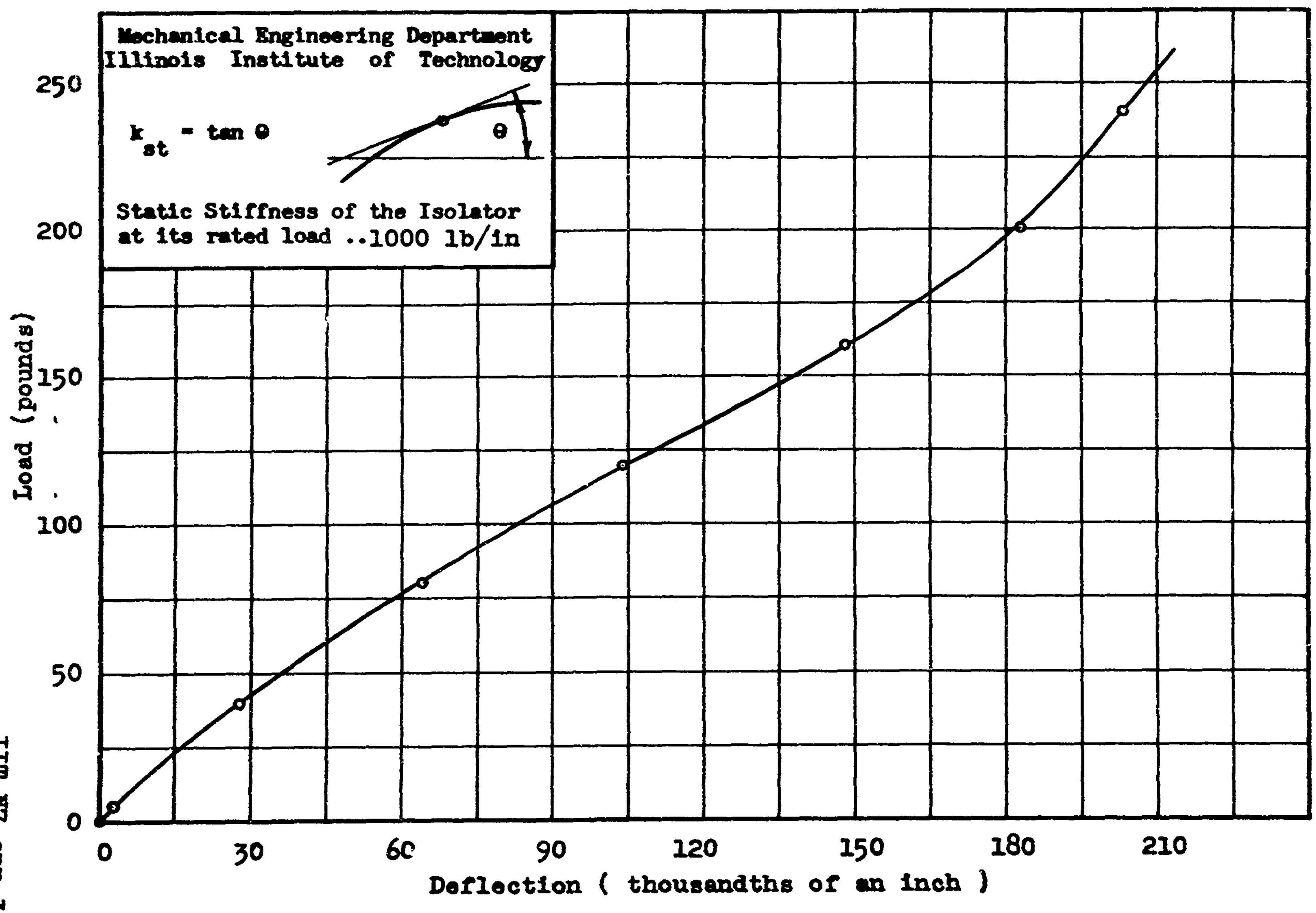
Transmissibility vs Frequency Curve - Lord 200 XPH 75

IIT-N7-onr-32904



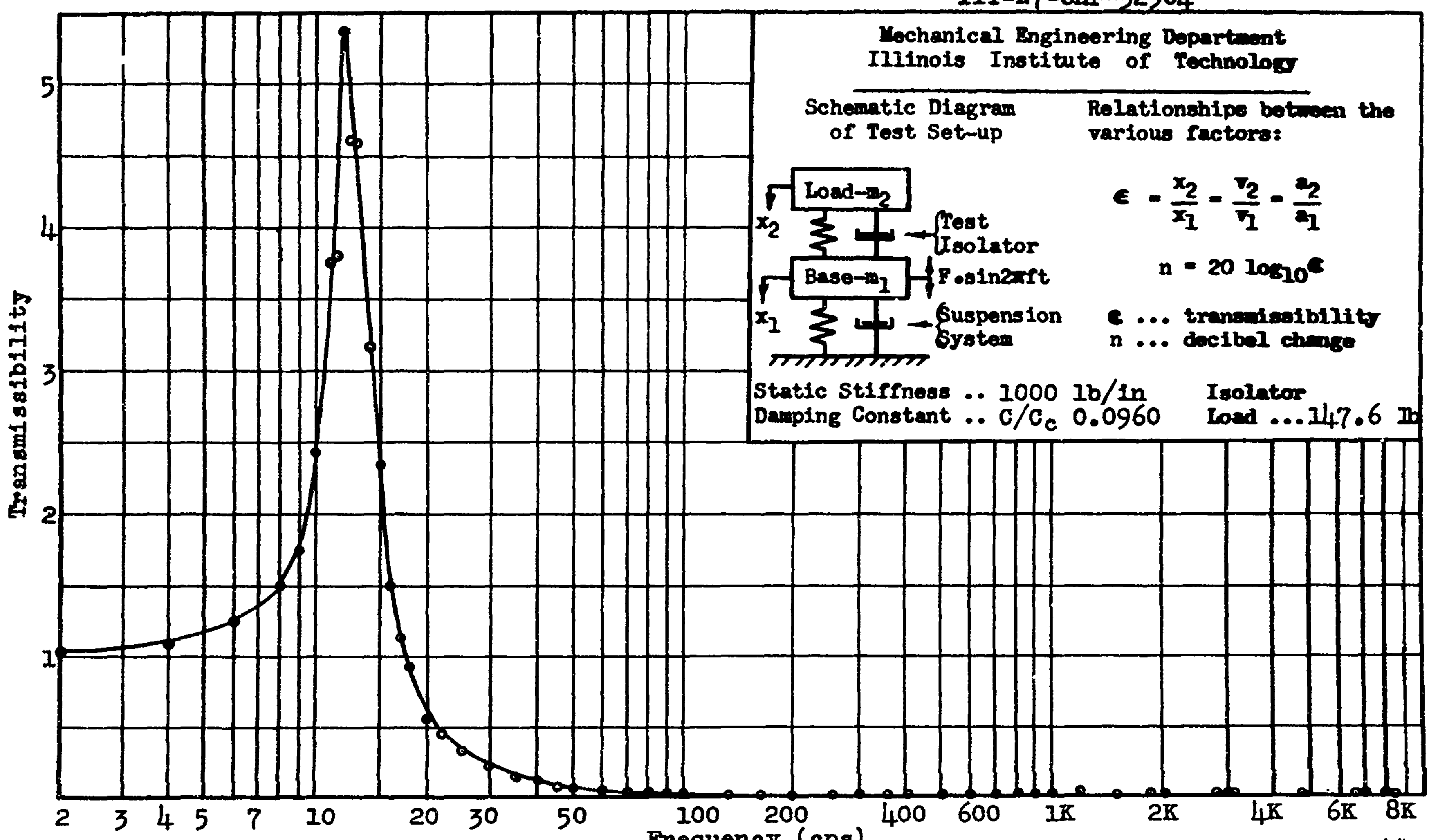
$\log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 200 XPH 75

111L-c



Load-Deflection Curve - MB 507 C 15

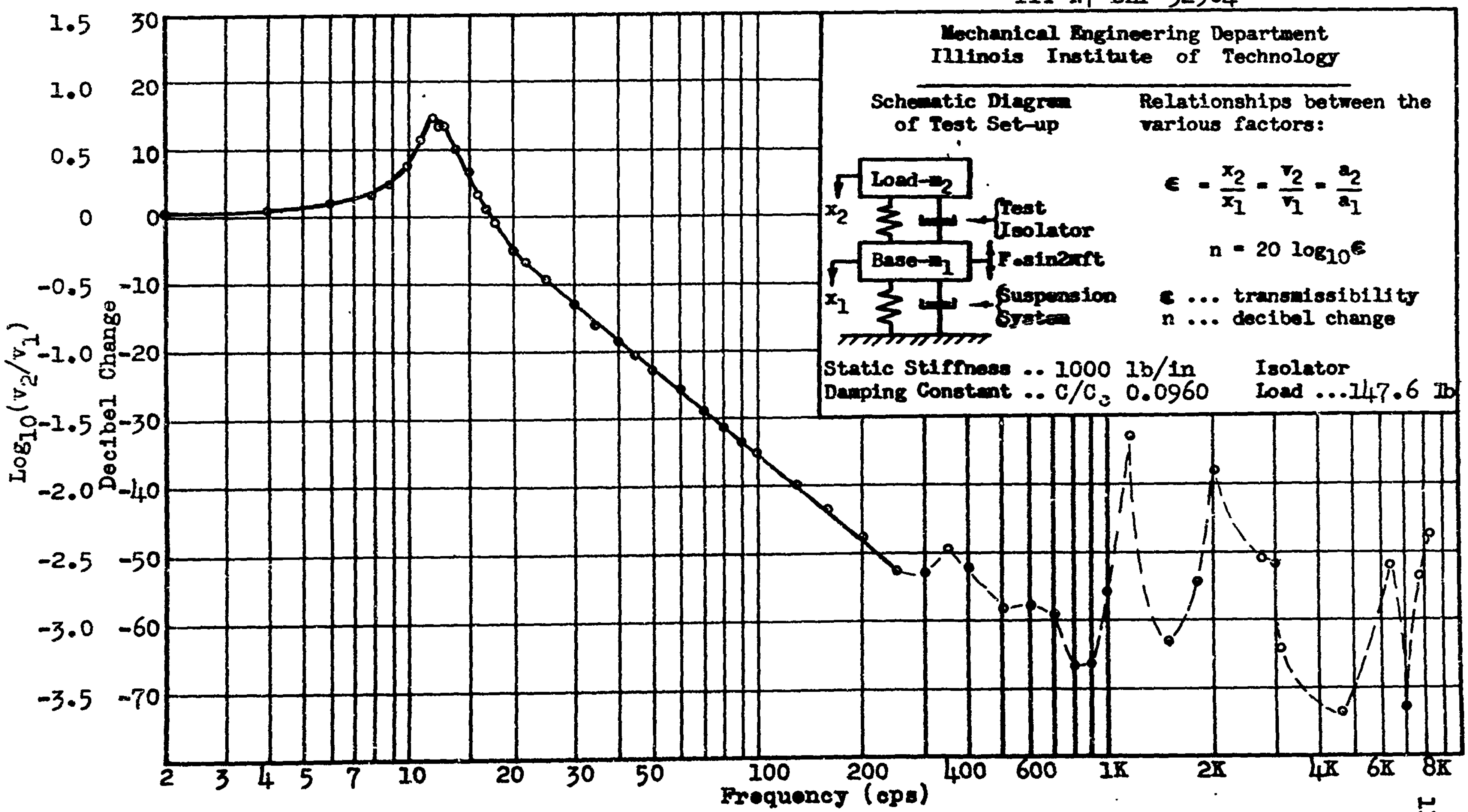
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - MB 507 C 15

112M-b

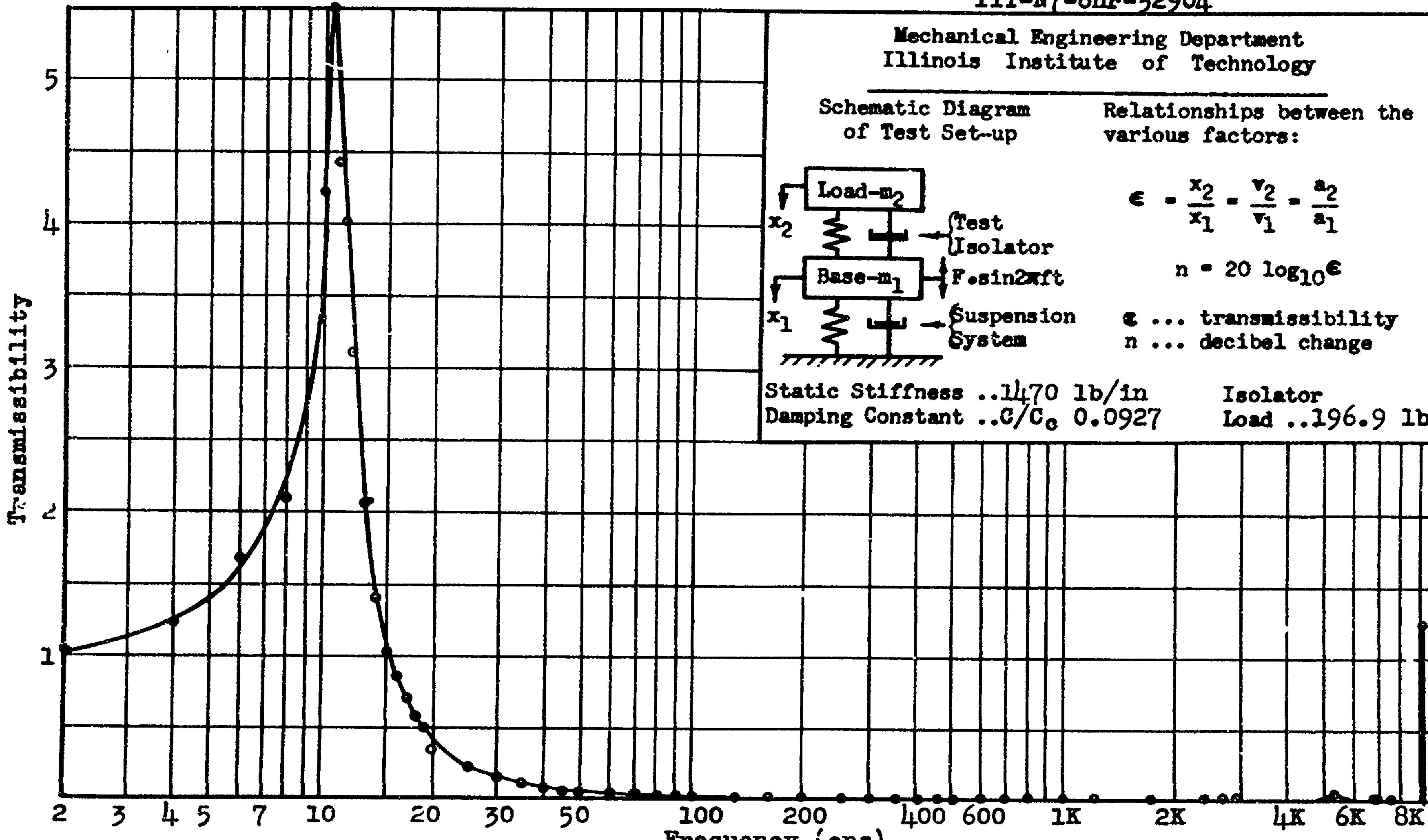
IIT-N7-onr-32904



$\log_{10}(v_2/v_1)$ vs Frequency Curve - MB 507 C 15

112M-c

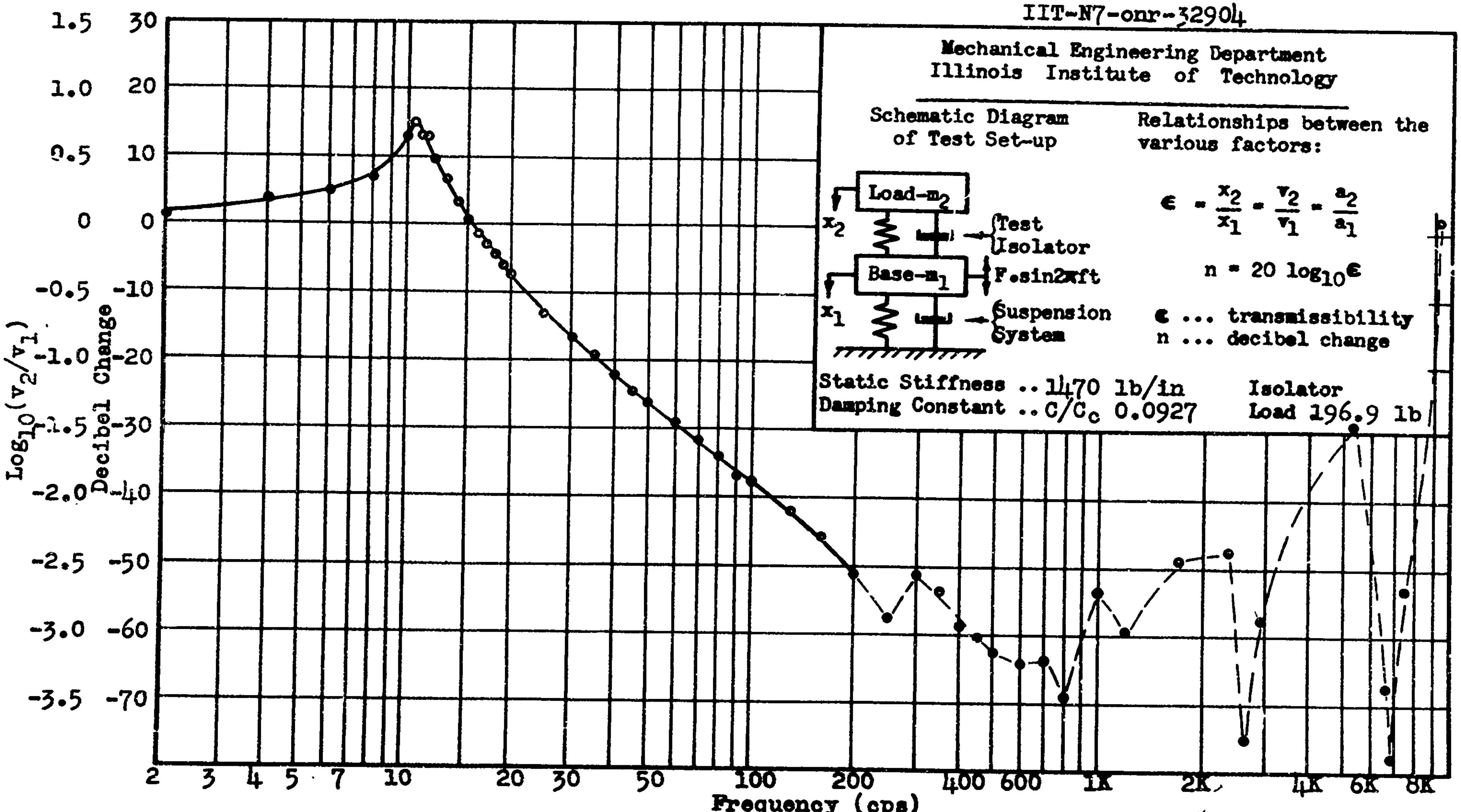
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - MB 507 C 15

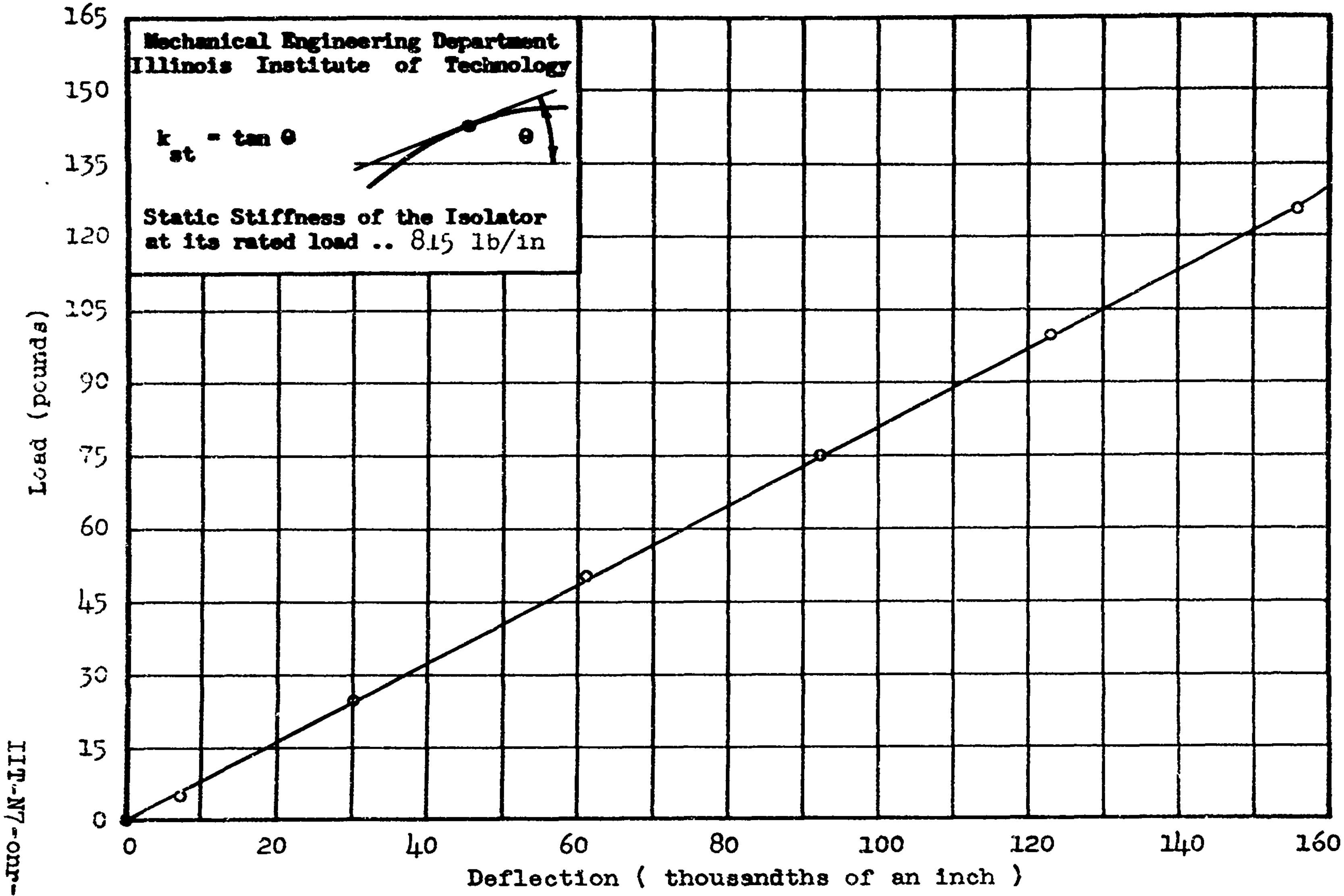
112M-b

IIT-N7-onr-32904

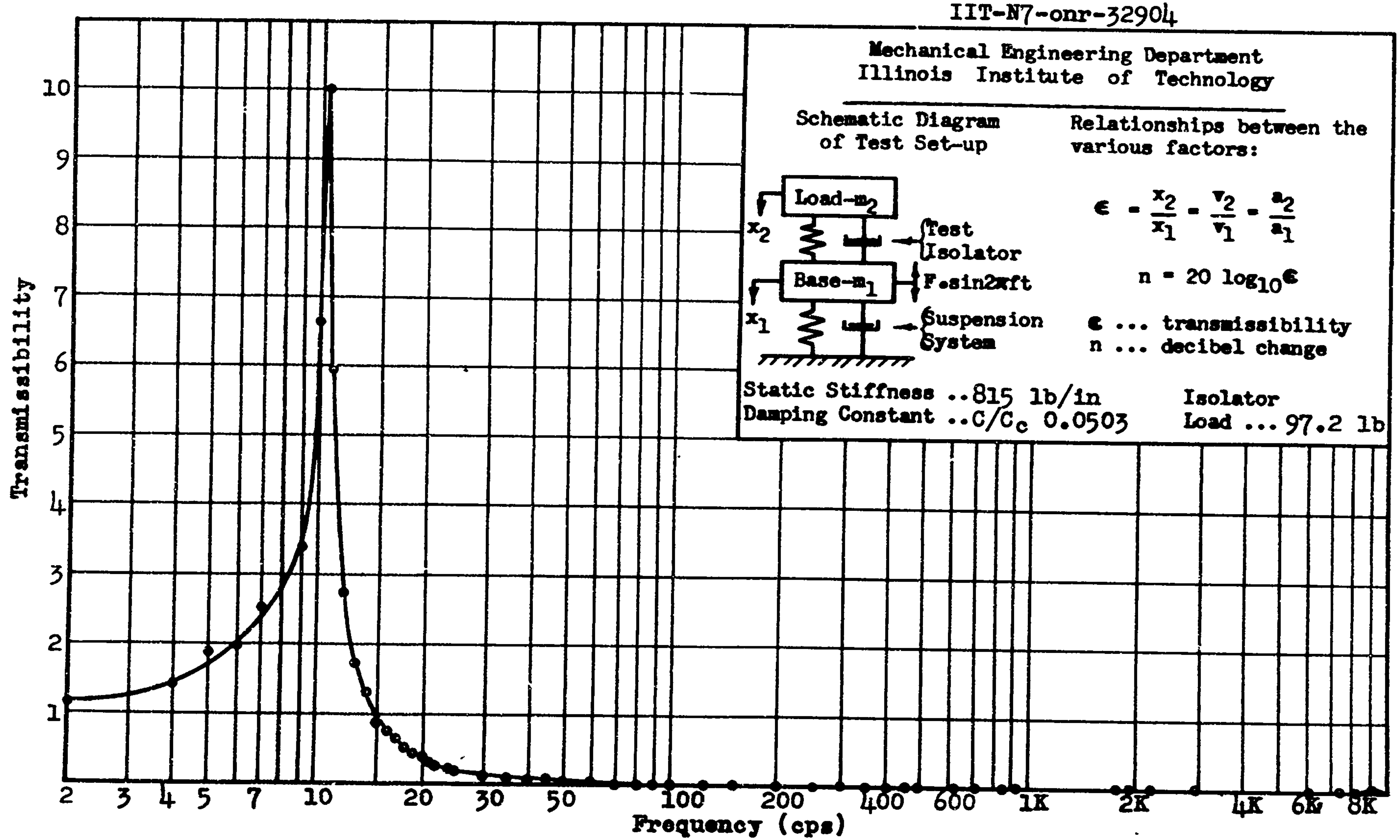


$\log_{10}(v_2/v_1)$ vs Frequency Curve - MB 507 C 15

112M-c

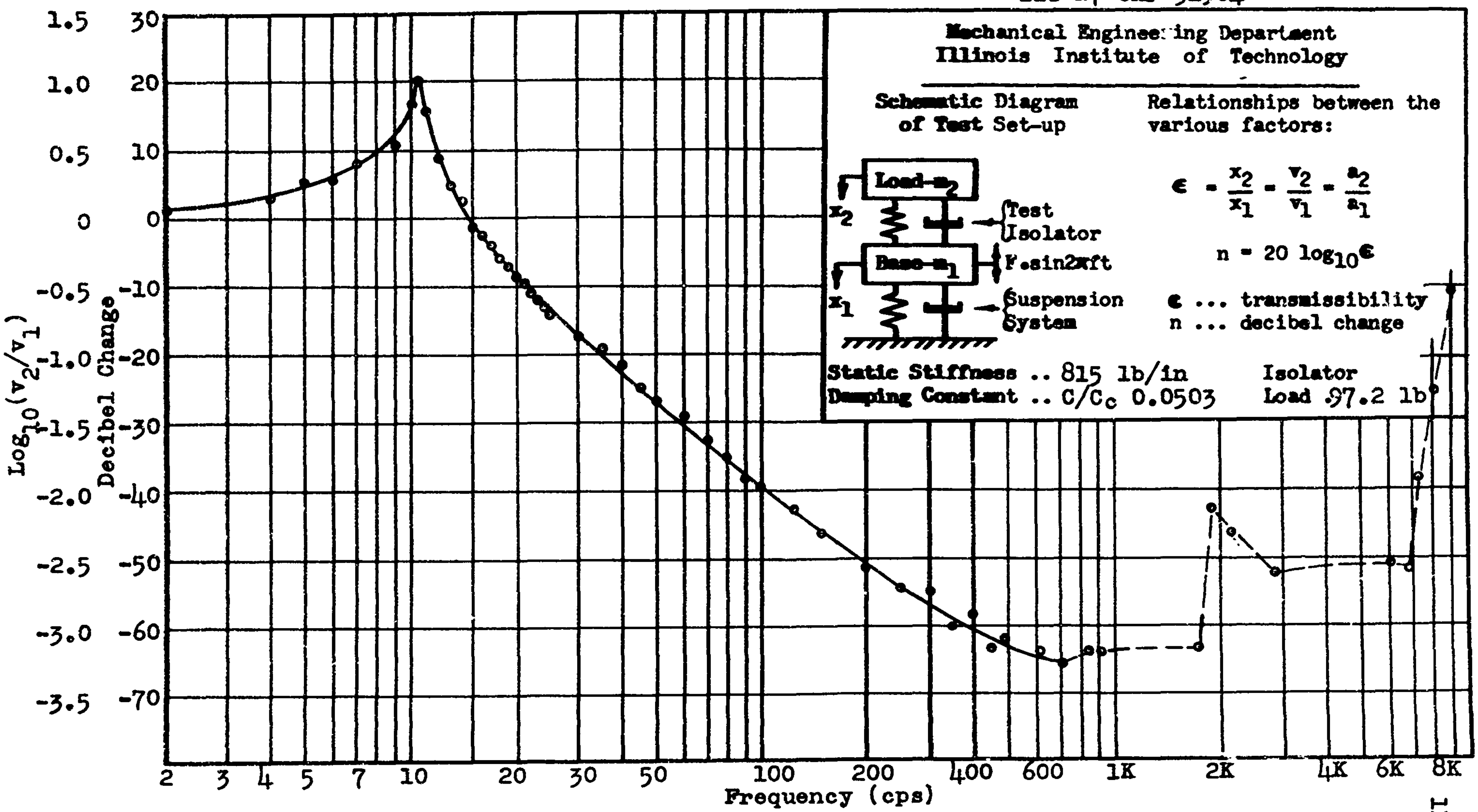


Load-Deflection Curve - Lord 204 PH 87



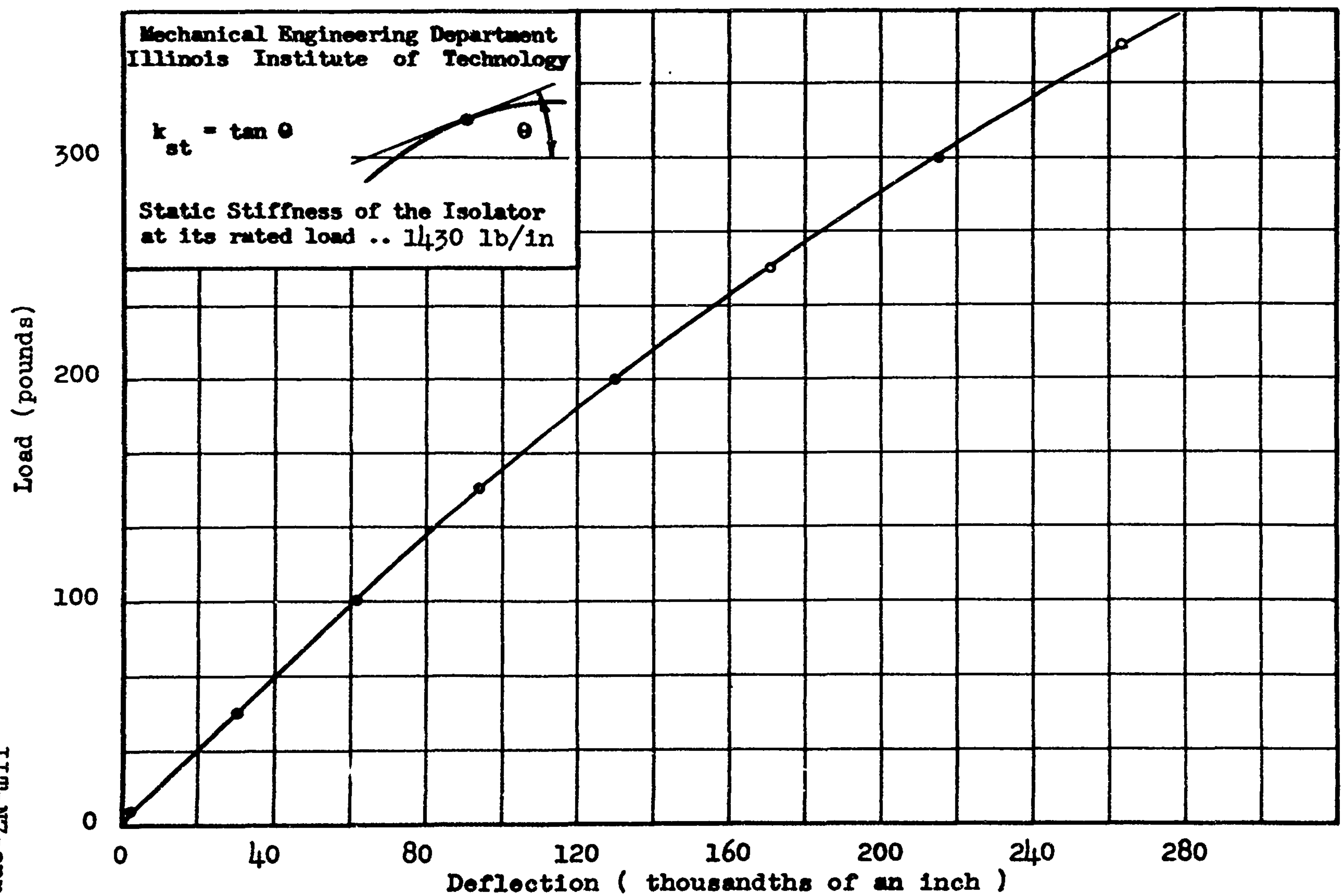
Transmissibility vs Frequency Curve - Lord 204 PH 87

IIT-N7-onr-32904



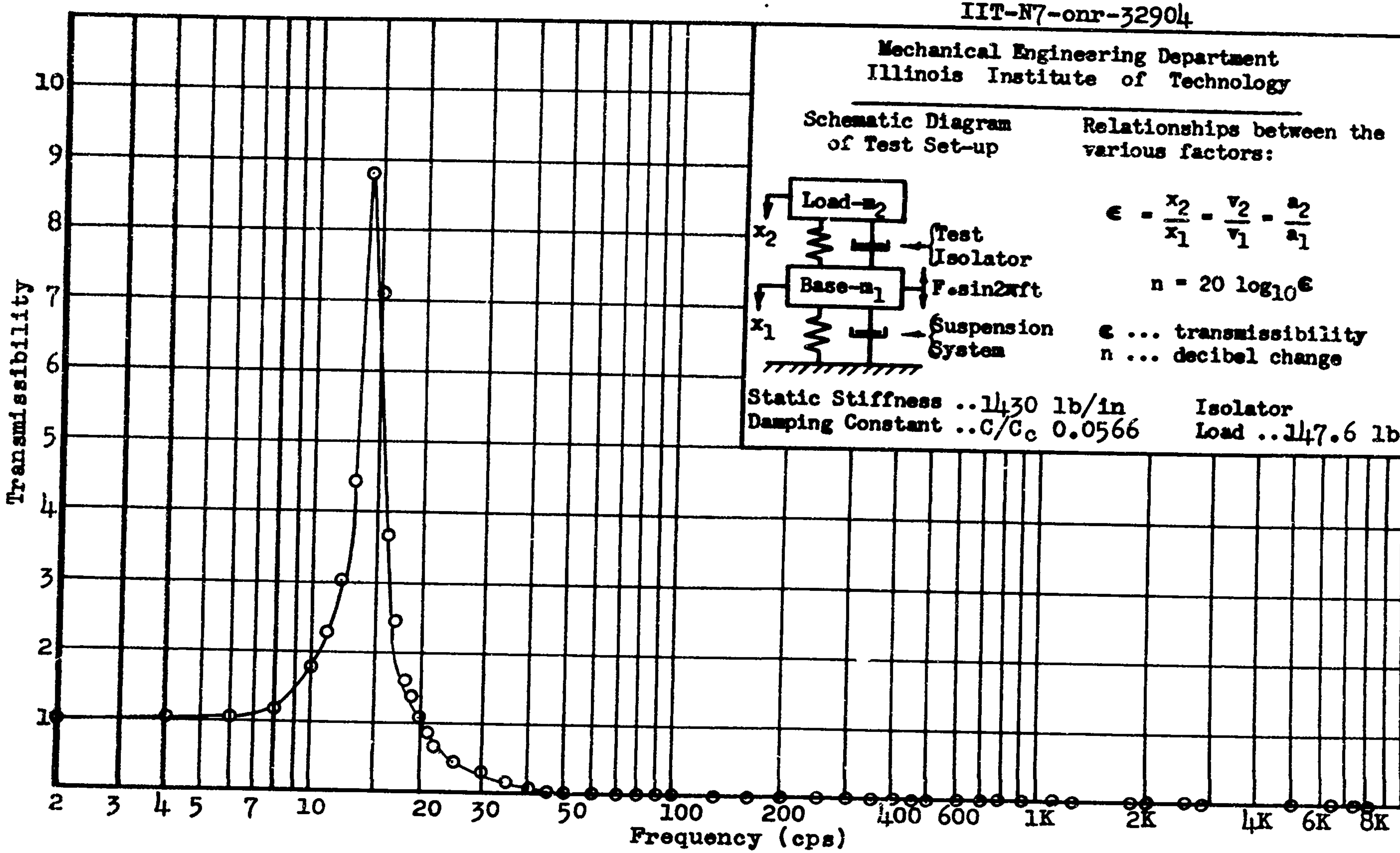
$Log_{10}(v_2/v_1)$ vs Frequency Curve - Lord 204 PH 87

114L-c



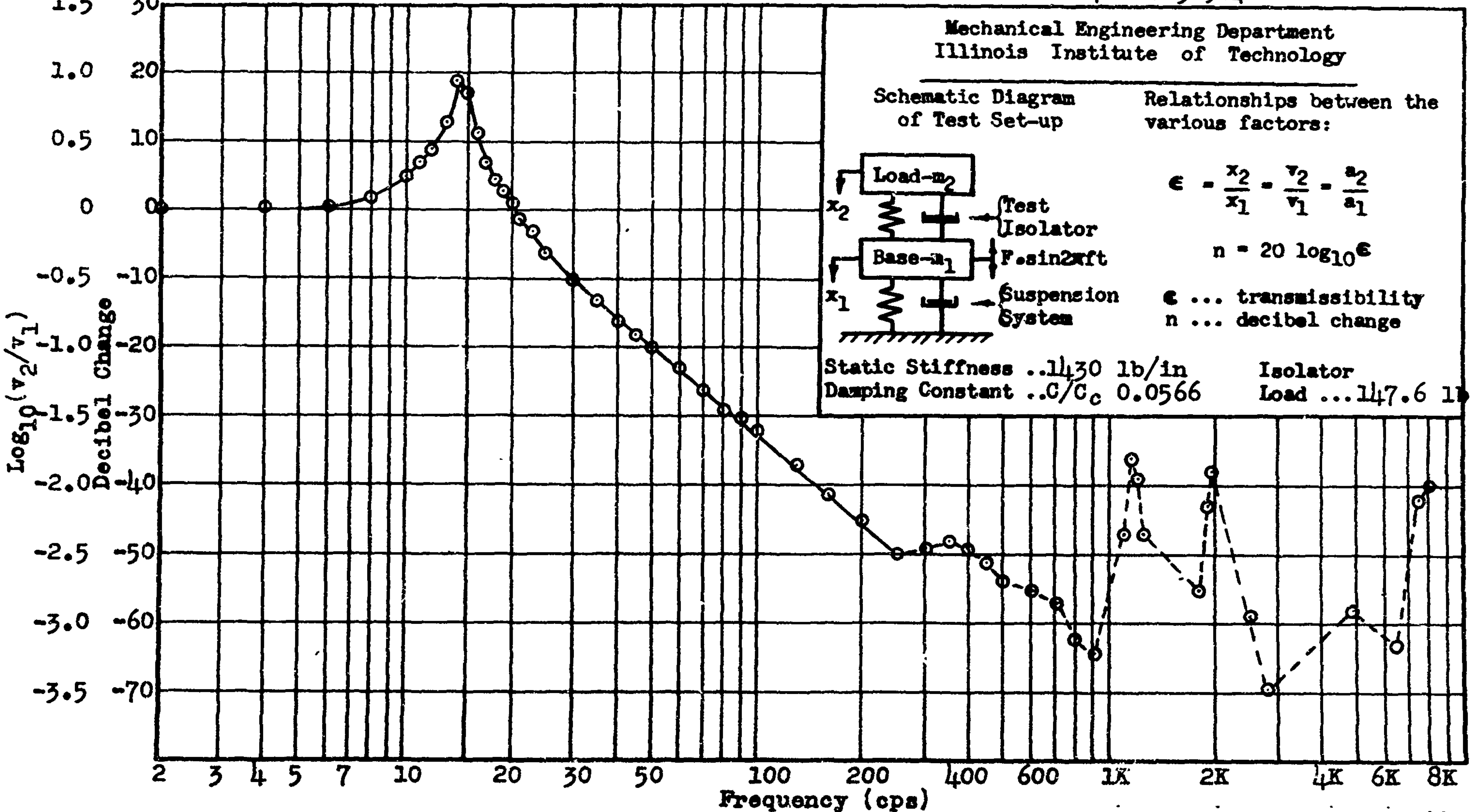
Load-Deflection Curve - MB 508 C 18

IIT-N7-onr-32904



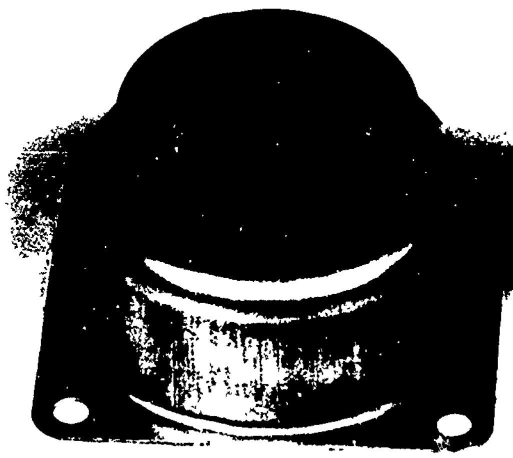
Transmissibility vs Frequency Curve - MB 508 C 18

115M-b



$\log_{10}(v_2/v_1)$ vs Frequency Curve - MB 508 C 18

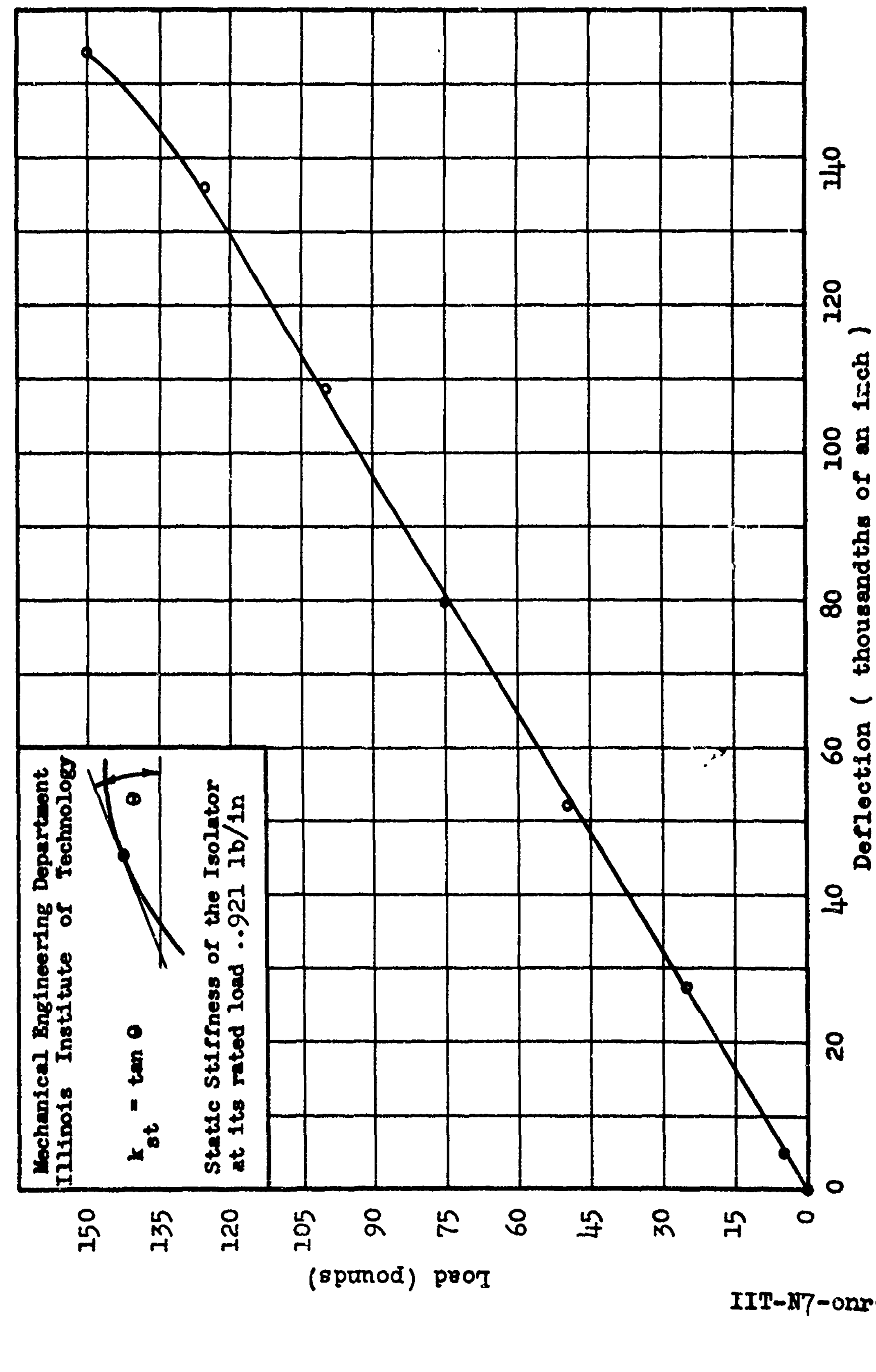
115M-c



LORD 204PH-100
132 L

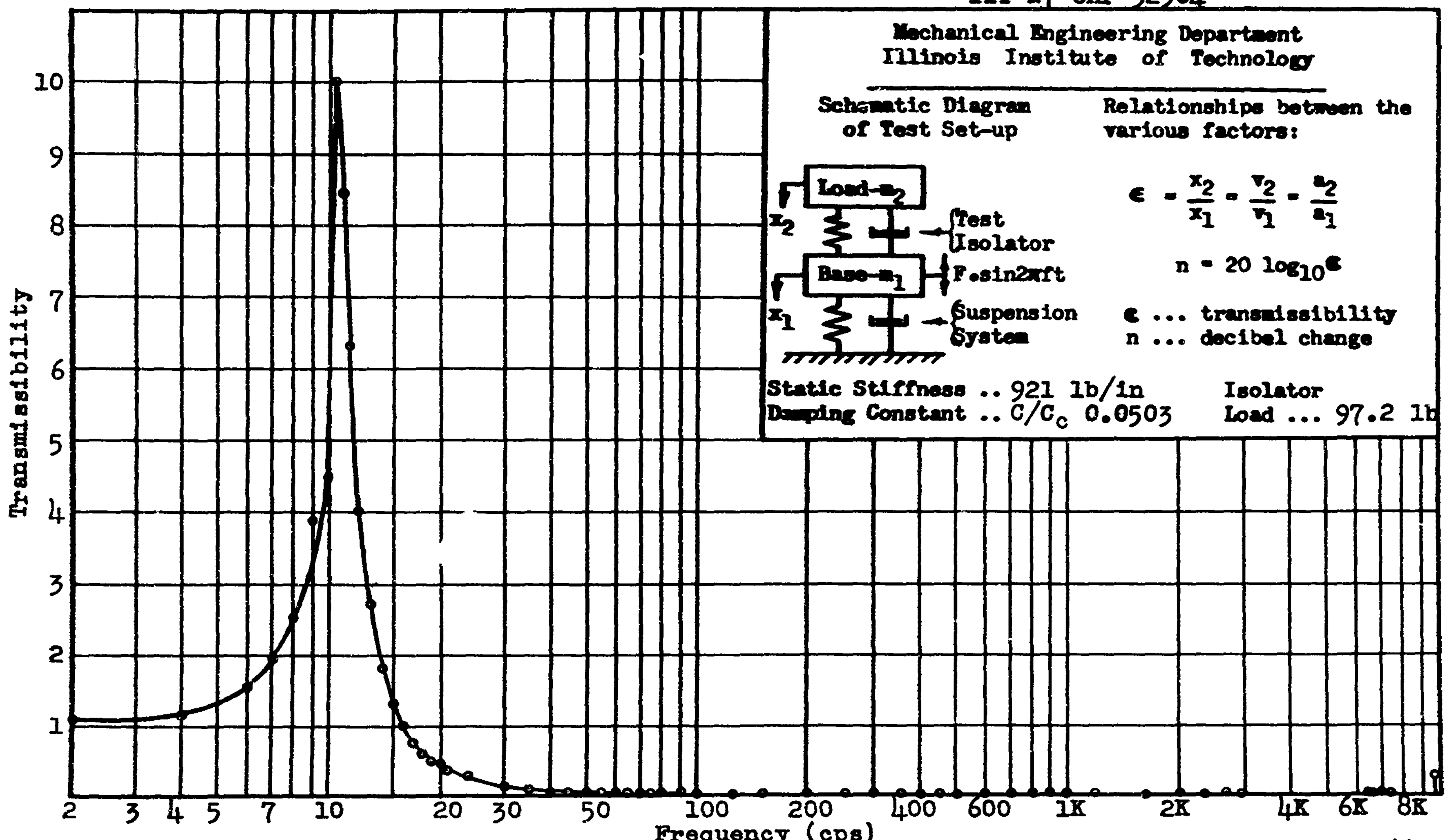
MB 508-C-22
133 M

BUSHINGS INC. 3100
134 V



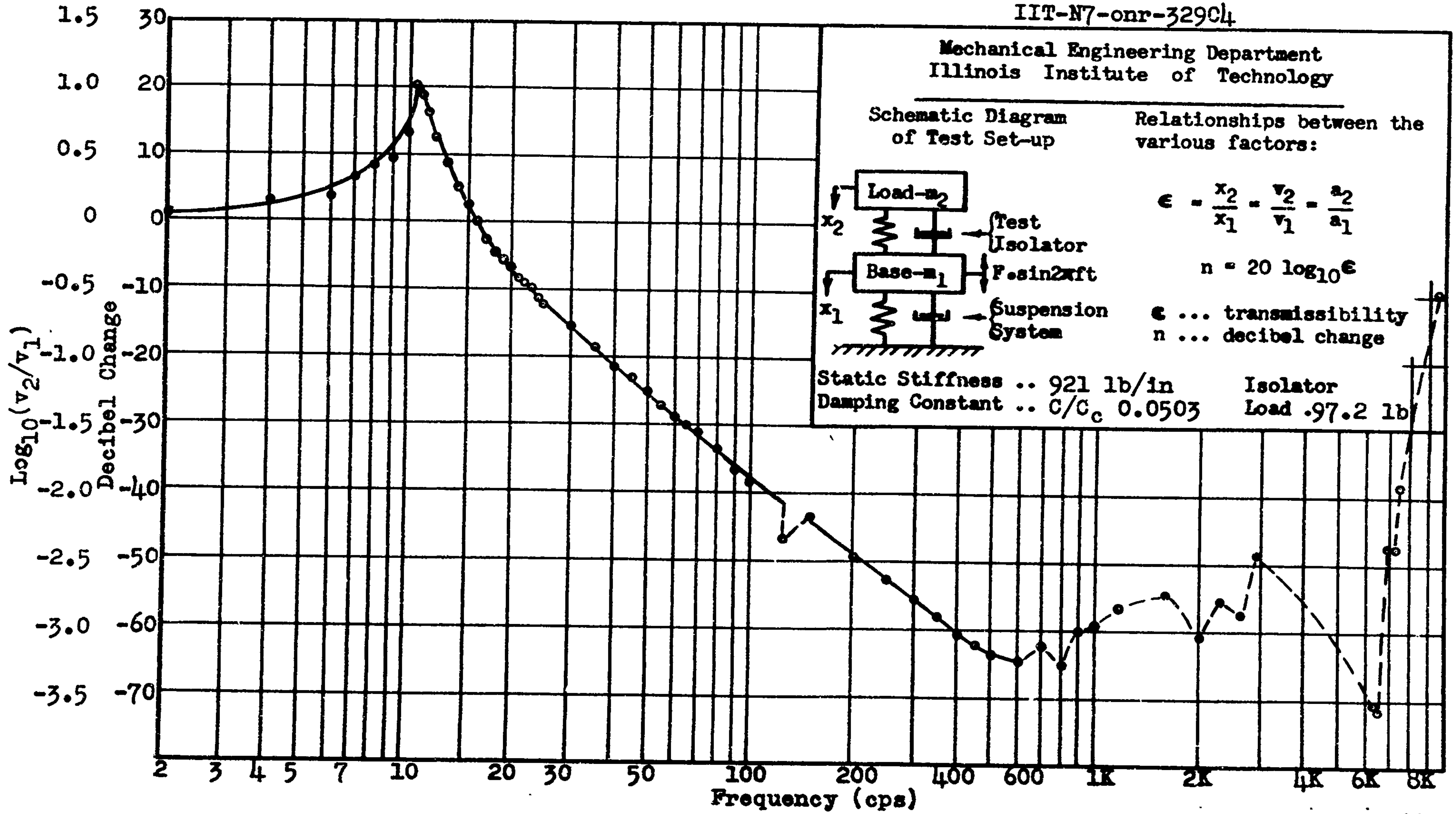
Load-Deflection Curve - Lord 204 PH 100

IIT-N7-onr-32904

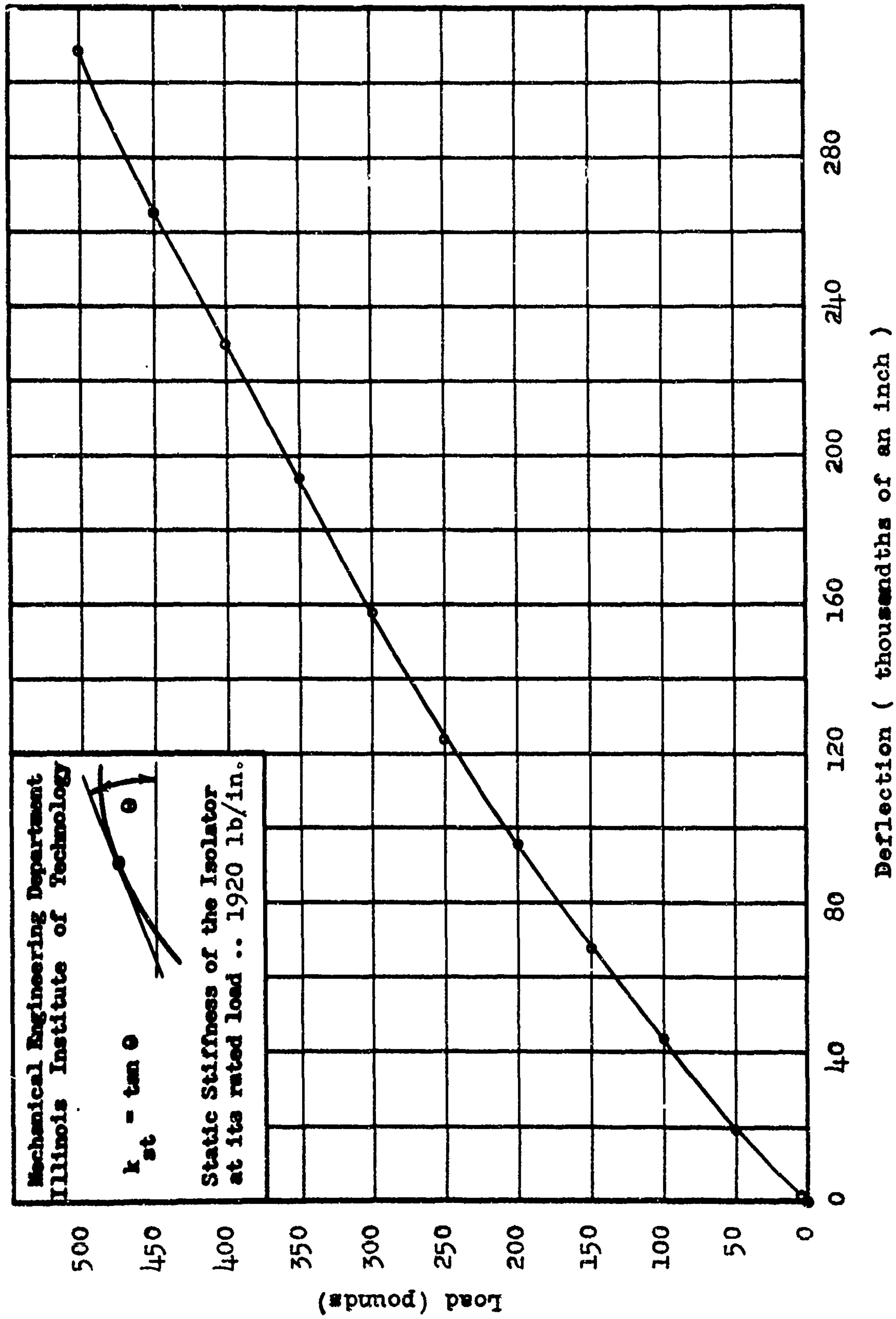


Transmissibility vs Frequency Curve - Lord 204 PH 100

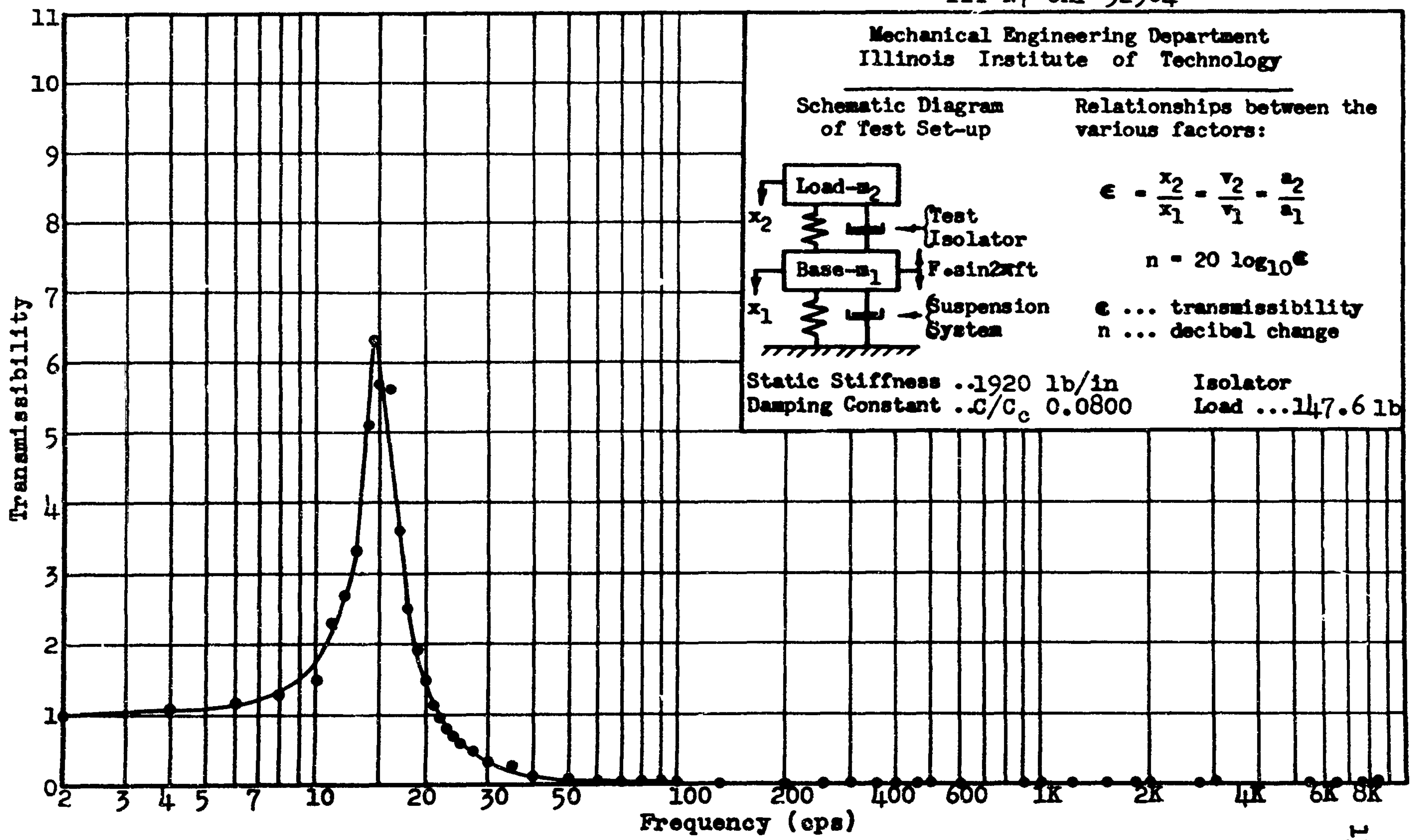
132L-b



$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 204 PH 100

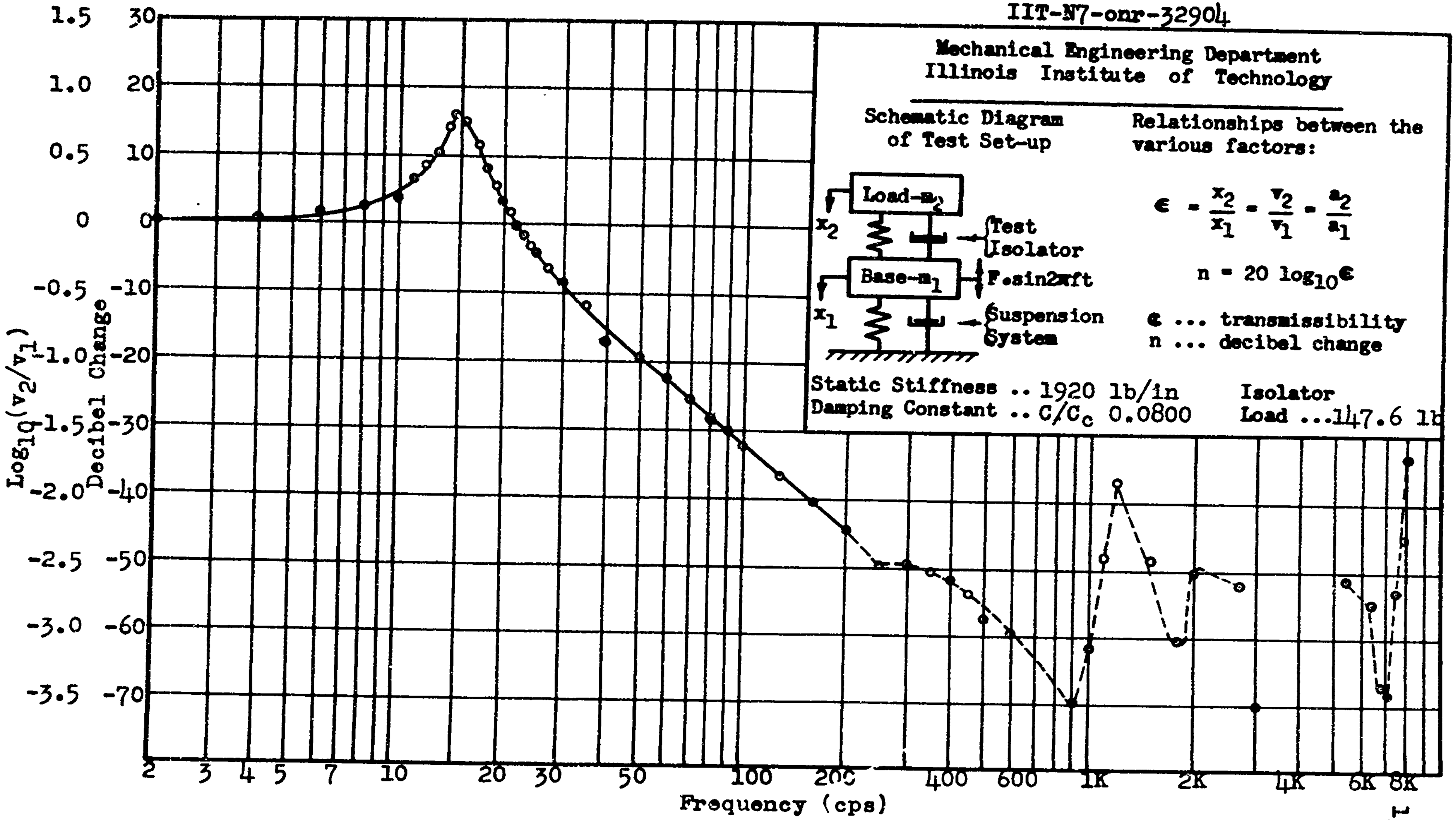


Load-Deflection Curve - MB 508 C 22



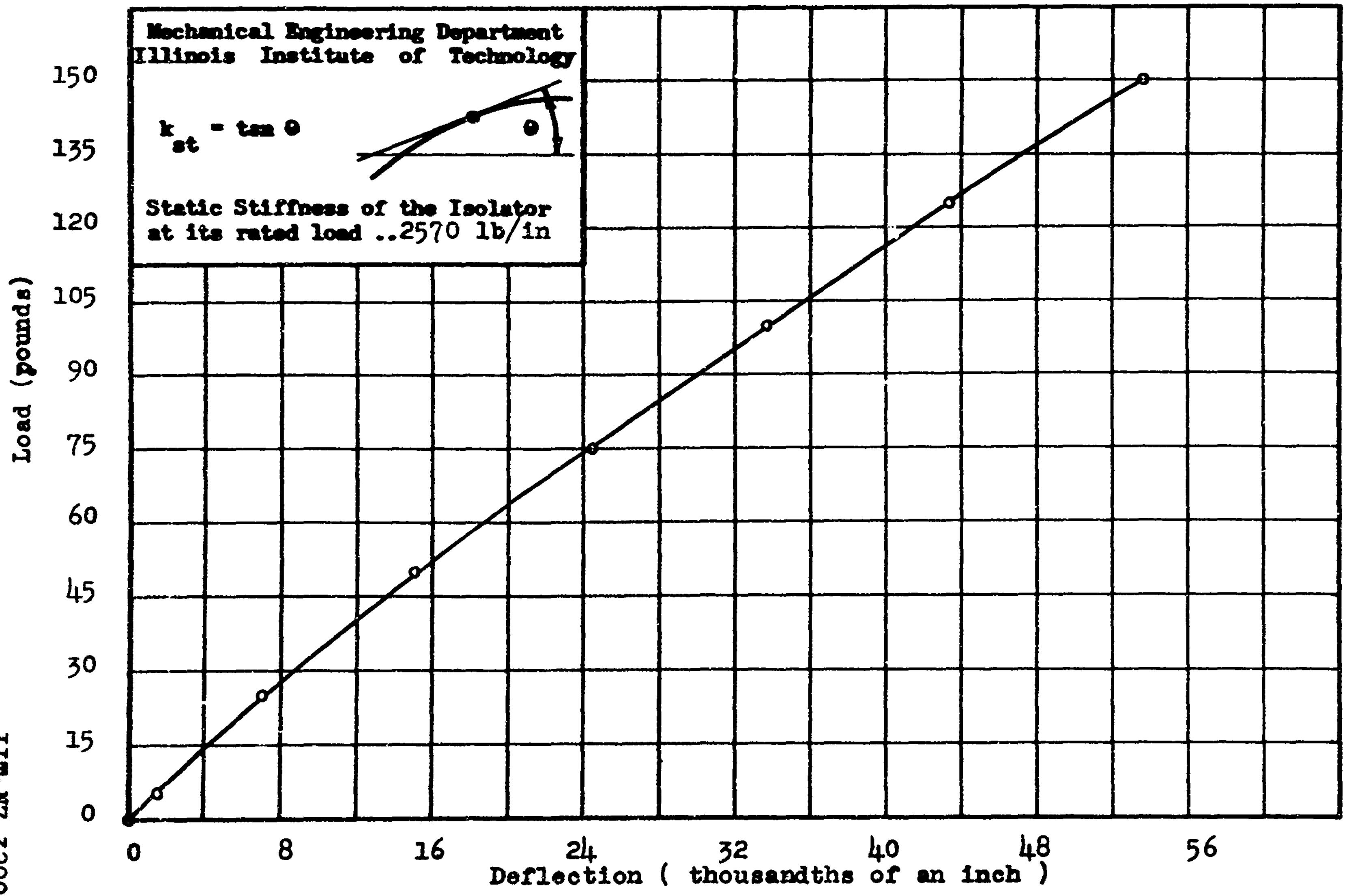
Transmissibility vs Frequency Curve - MB 508 C 22

IIT-N7-onr-32904



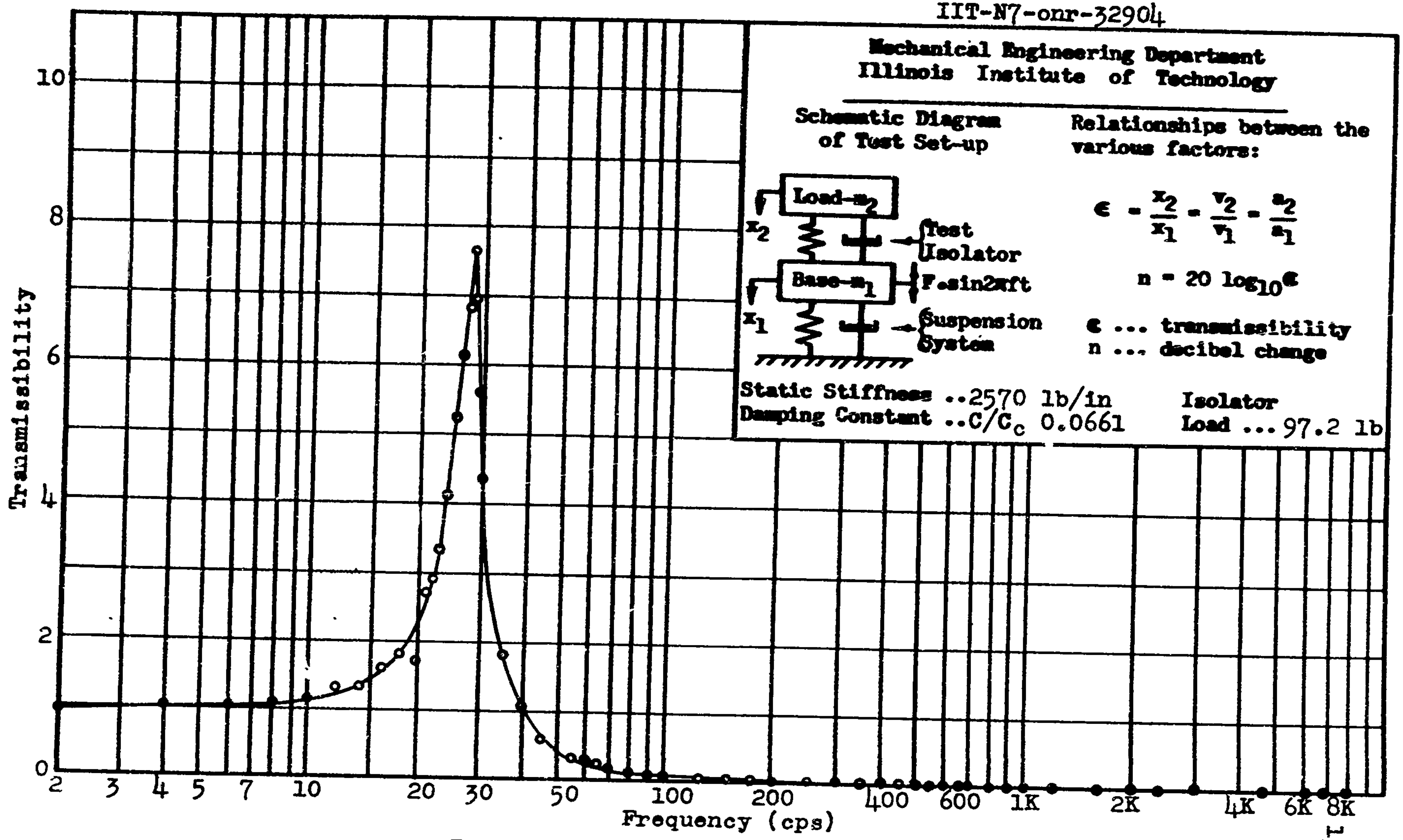
$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - MB 508 C 22

133M-c



Load-Deflection Curve - Bushing 3100

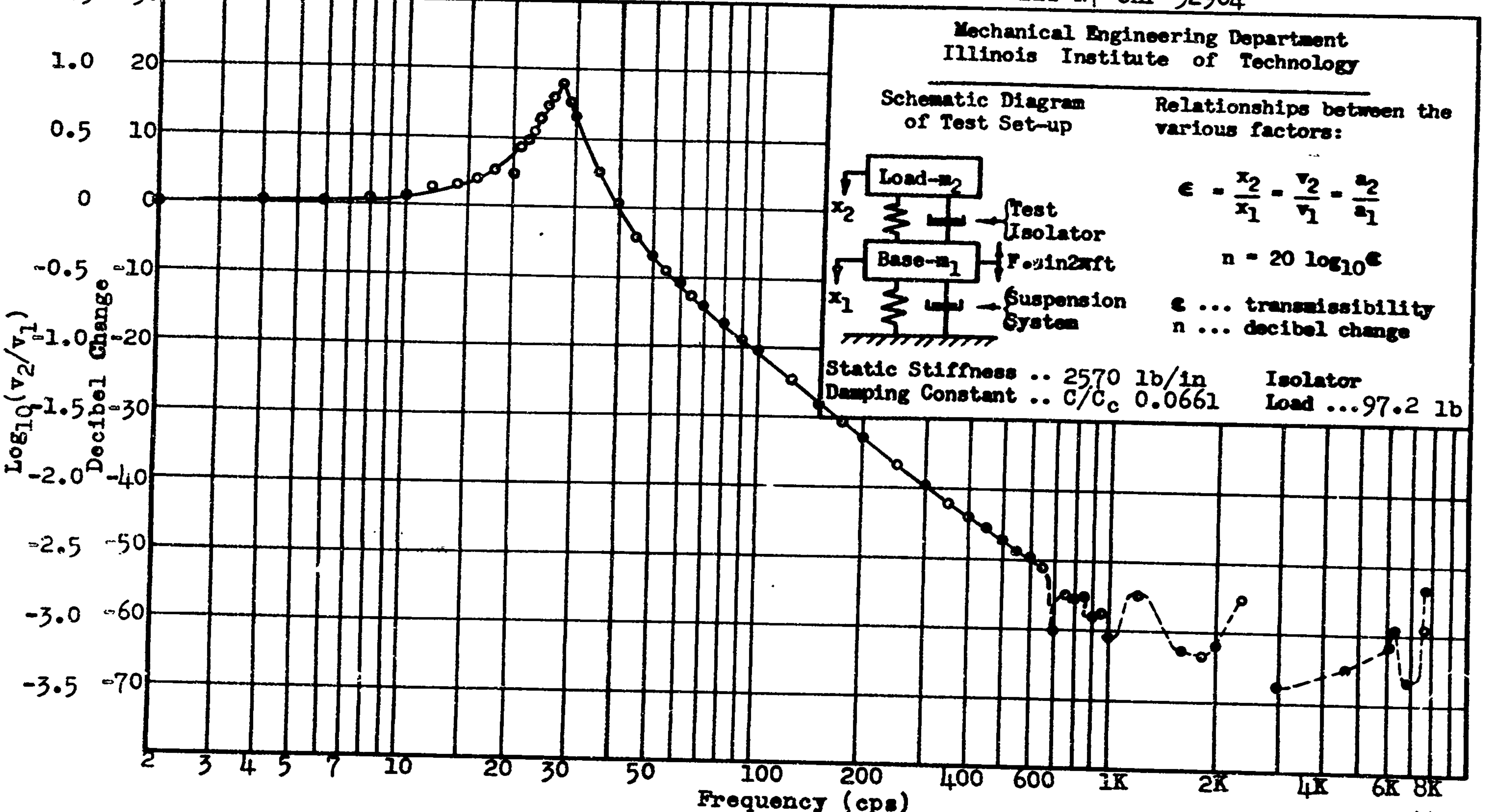
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Bushing 3100

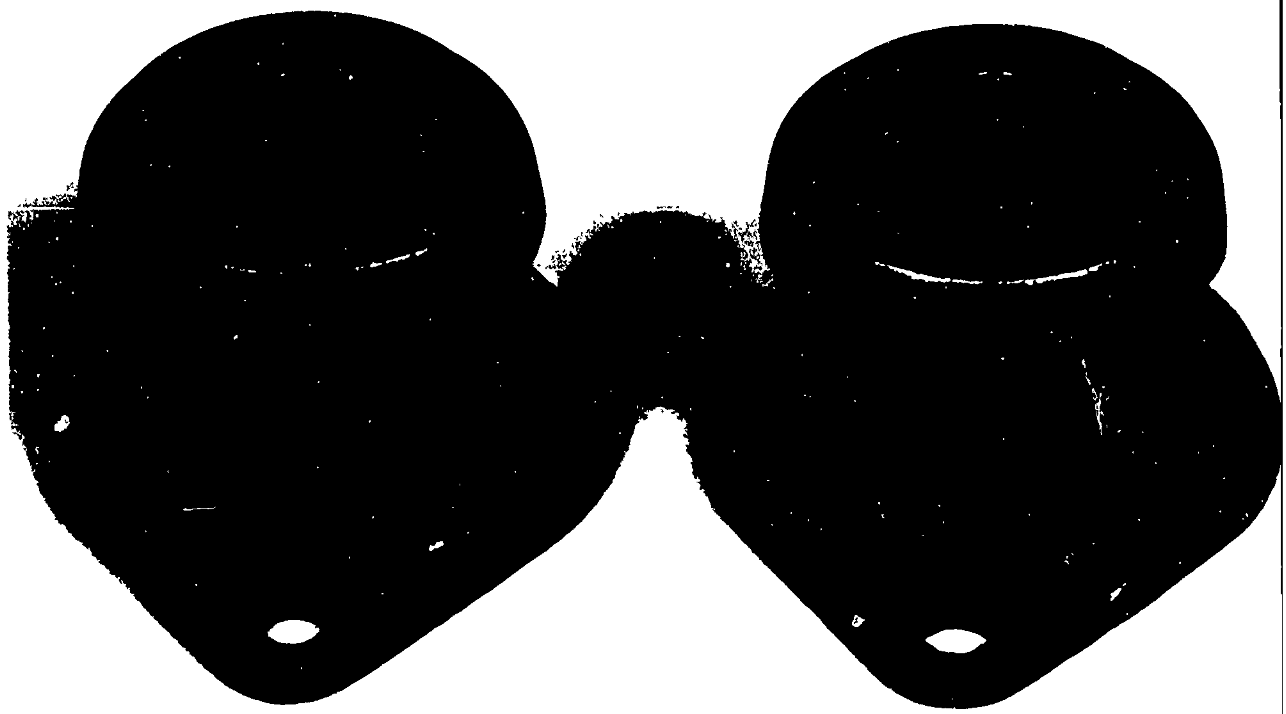
134V-b

IIT-N7-onr-32904



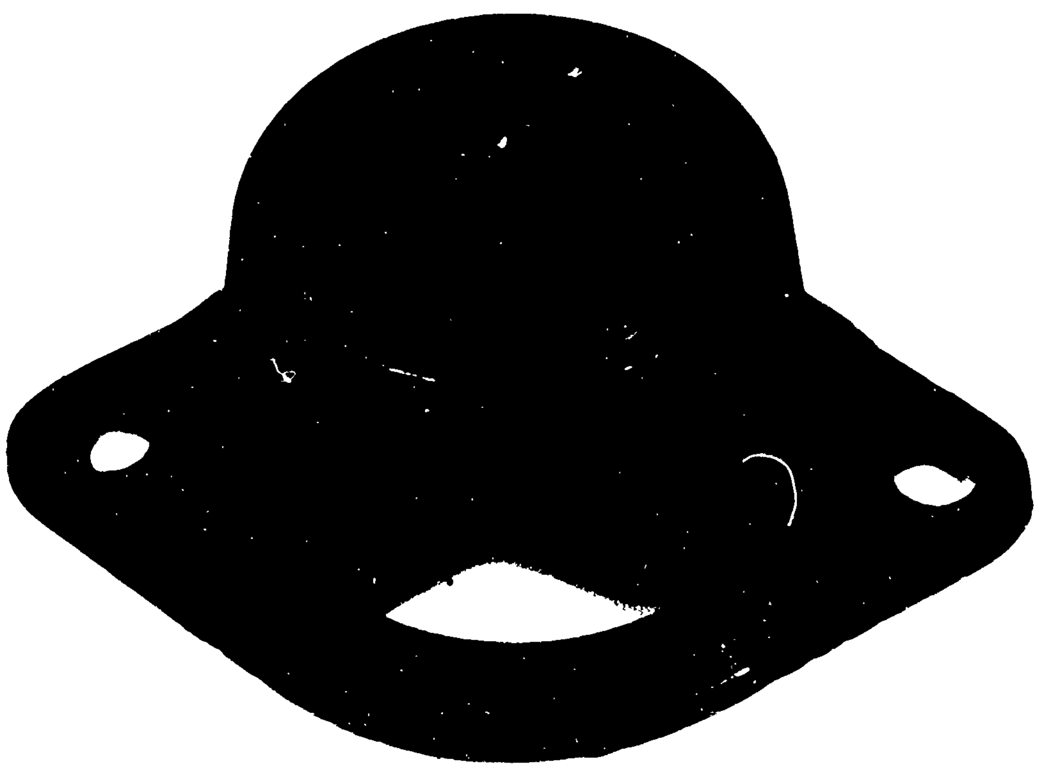
$Log_{10}(v_2/v_1)$ vs Frequency Curve - Bushing 3100

134V-c



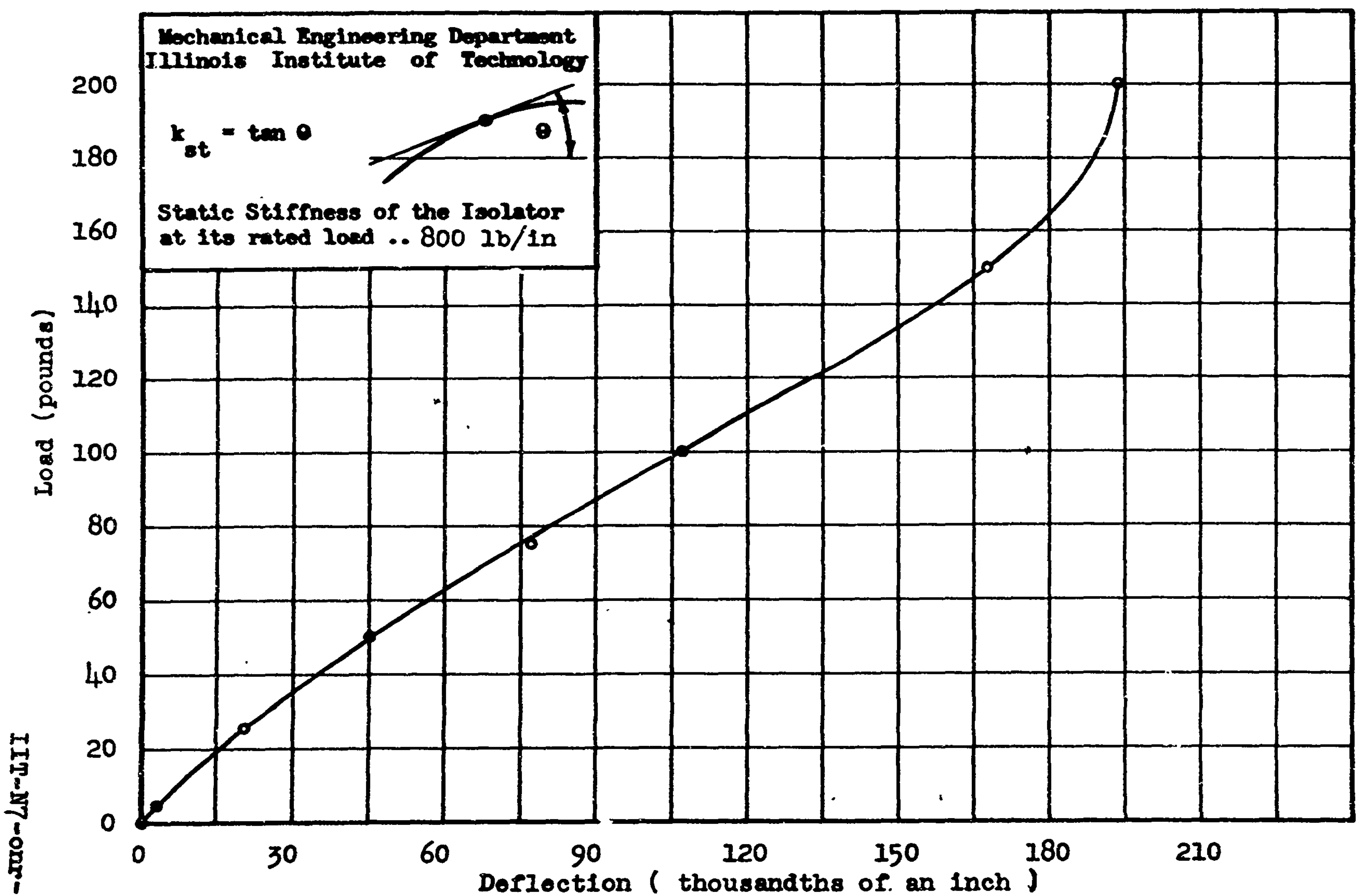
LORD 281PH-120
151 L

LORD 283PH-120
152 L



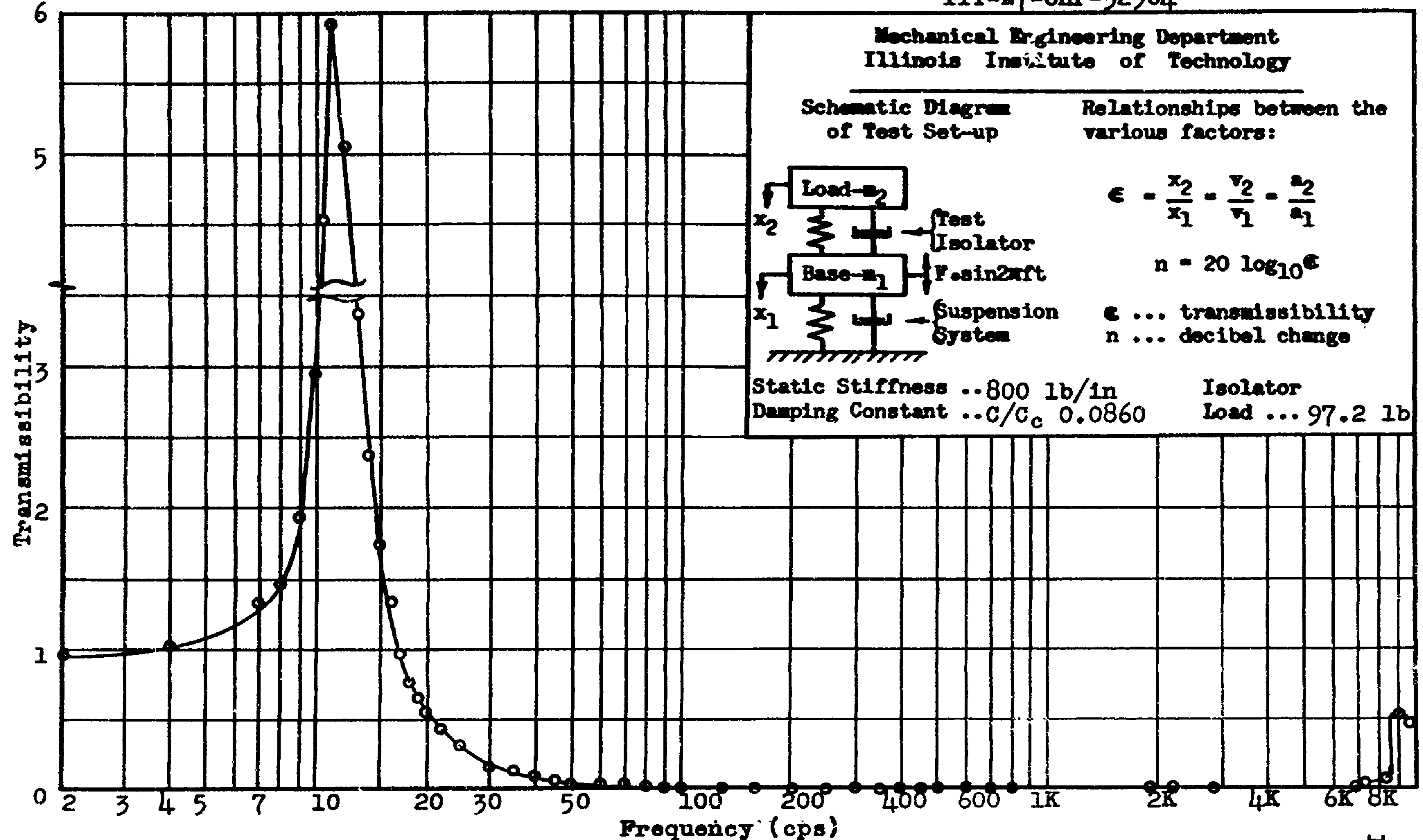
LORD 279PH-120
153 L

PLATE VI-11



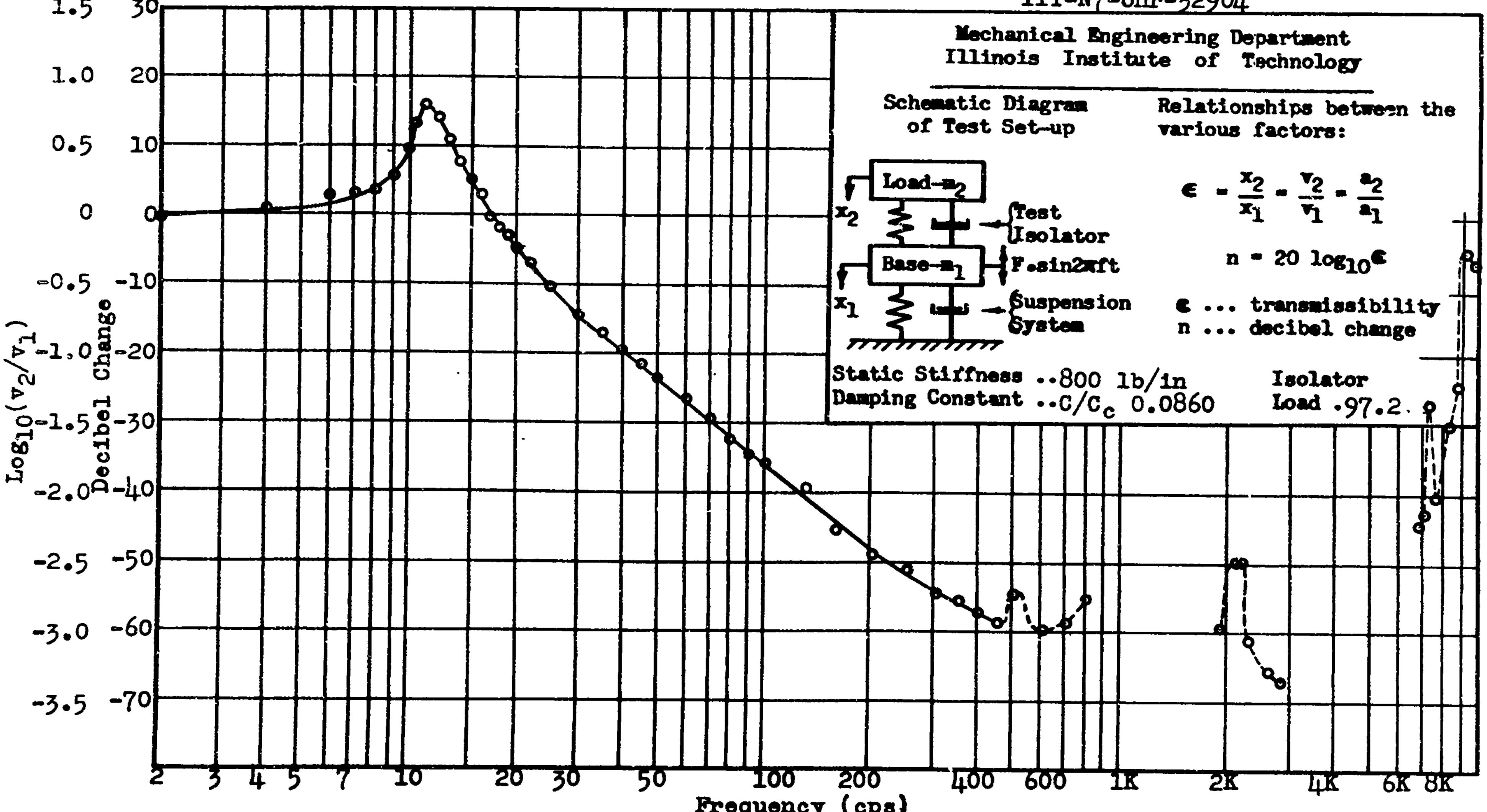
Load-Deflection Curve - Lord 281 PH 120

IIT-N7-onr-32904



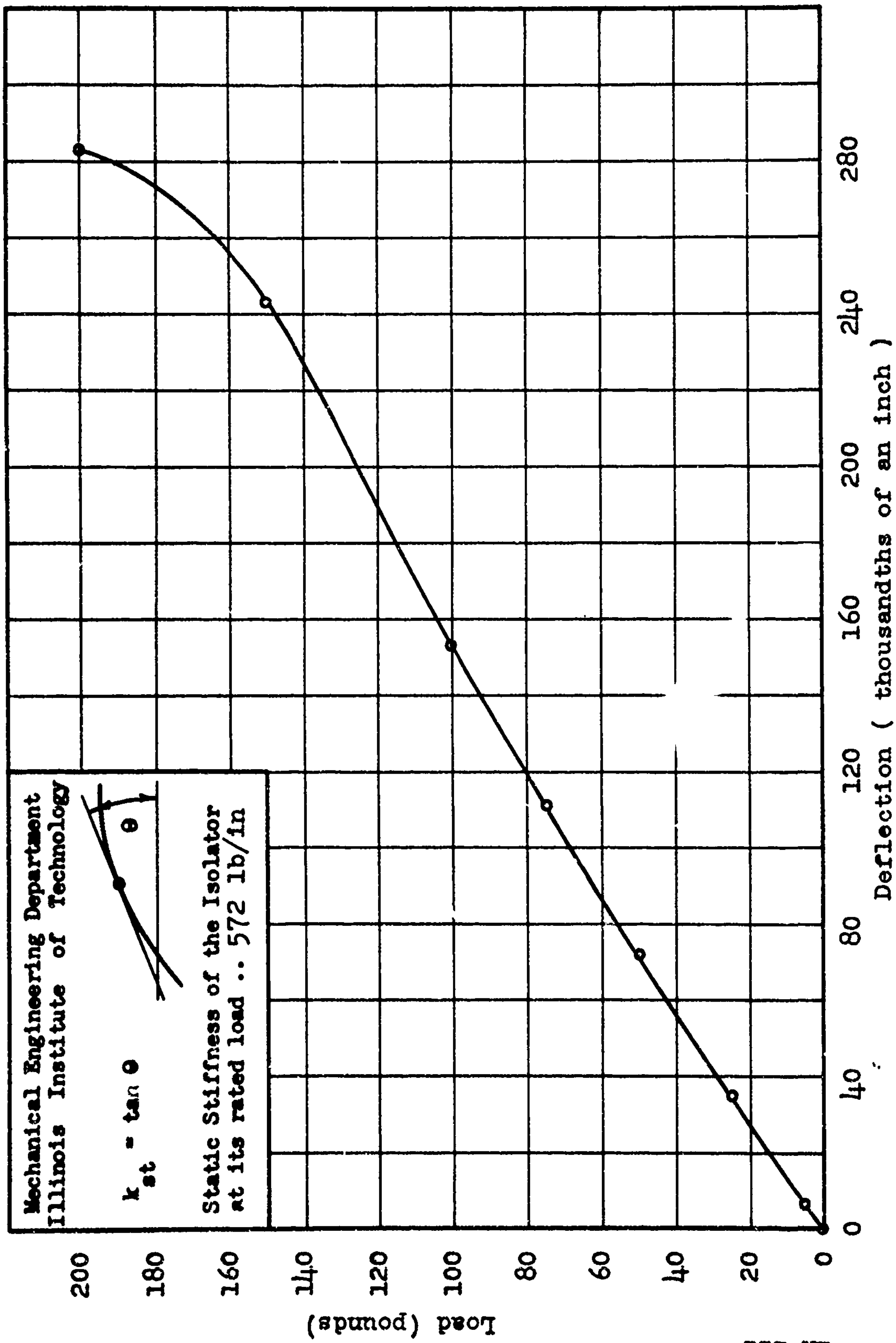
Transmissibility vs Frequency Curve - Lord 281 PH 120

151L-b

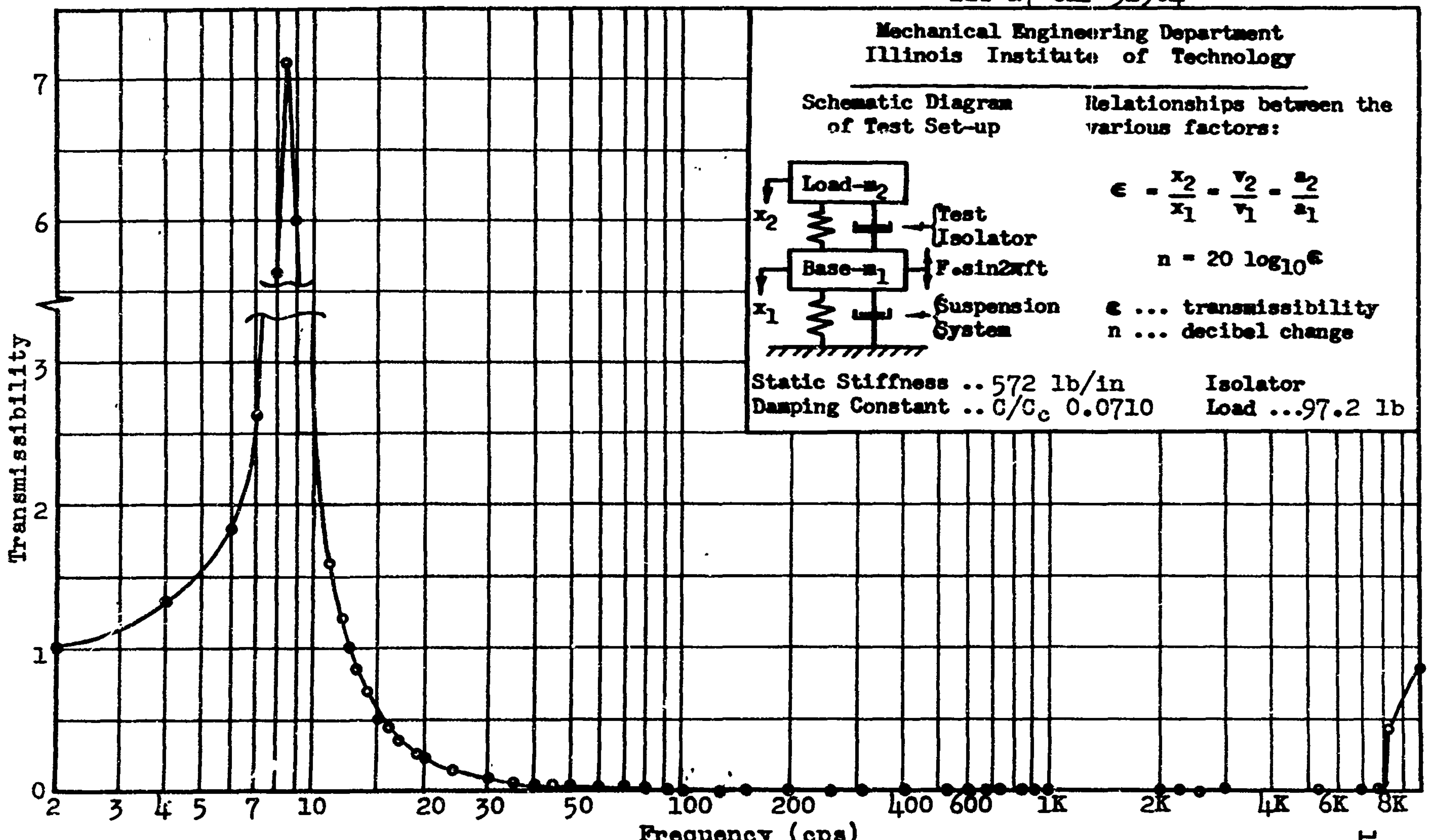


$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 281 PH 120

151L-c



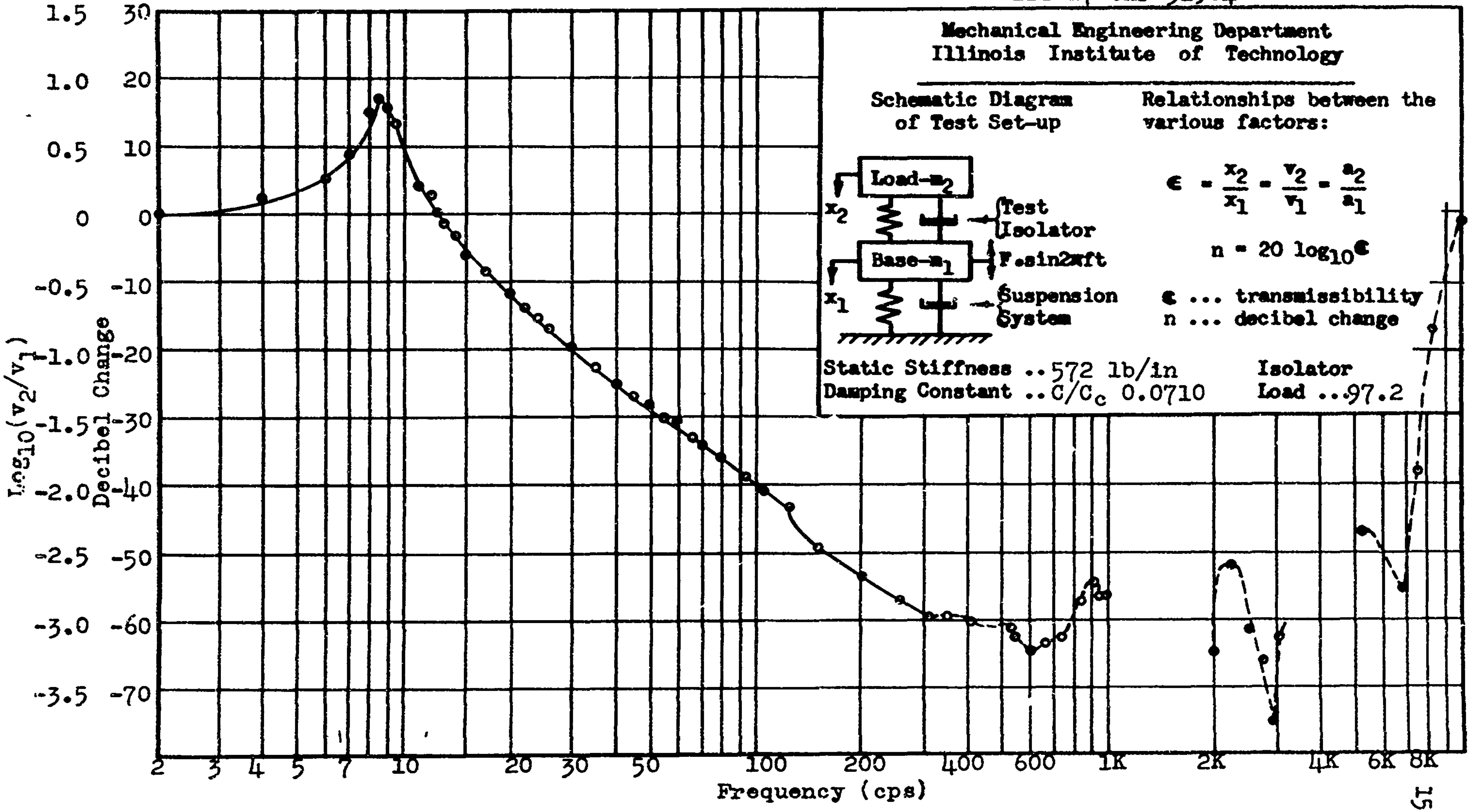
Load-Deflection Curve - Lord 283 PH 120



Transmissibility vs Frequency Curve - Lord 283 PH 120

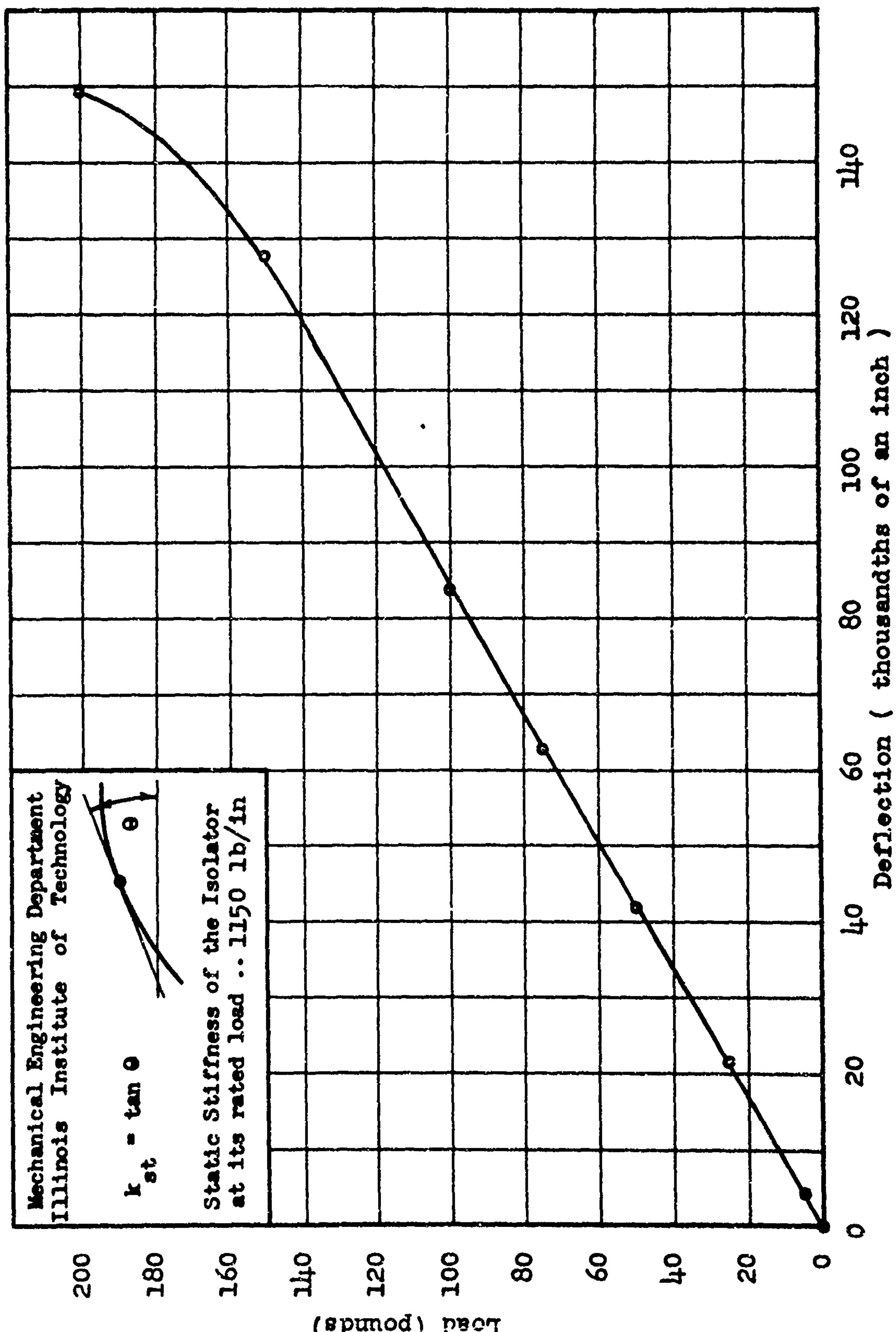
152L-b

IIT-N7-onr-32904



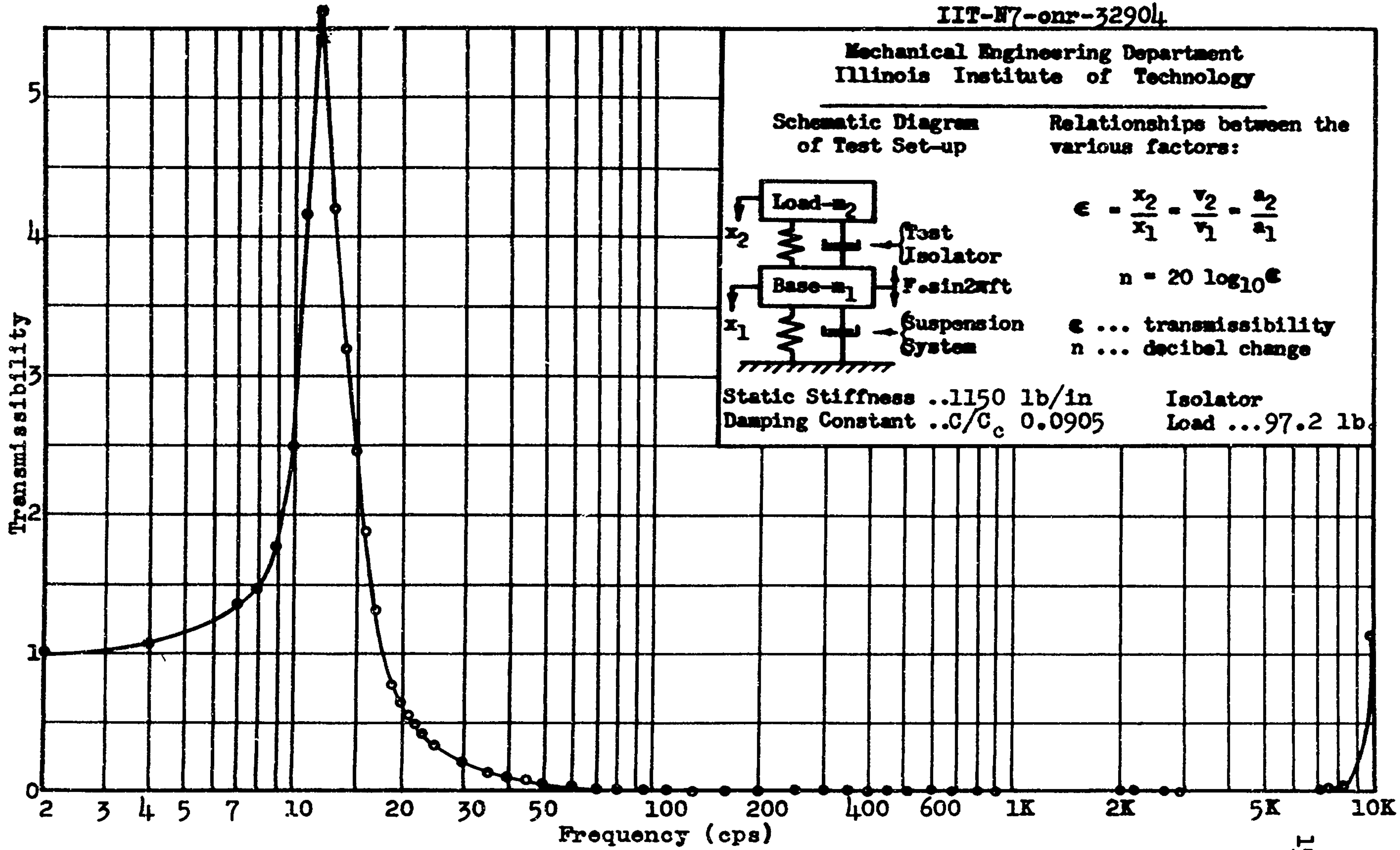
$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 283 PH 120

152L-c



Load-Deflection Curve - Lord 279 PH 120

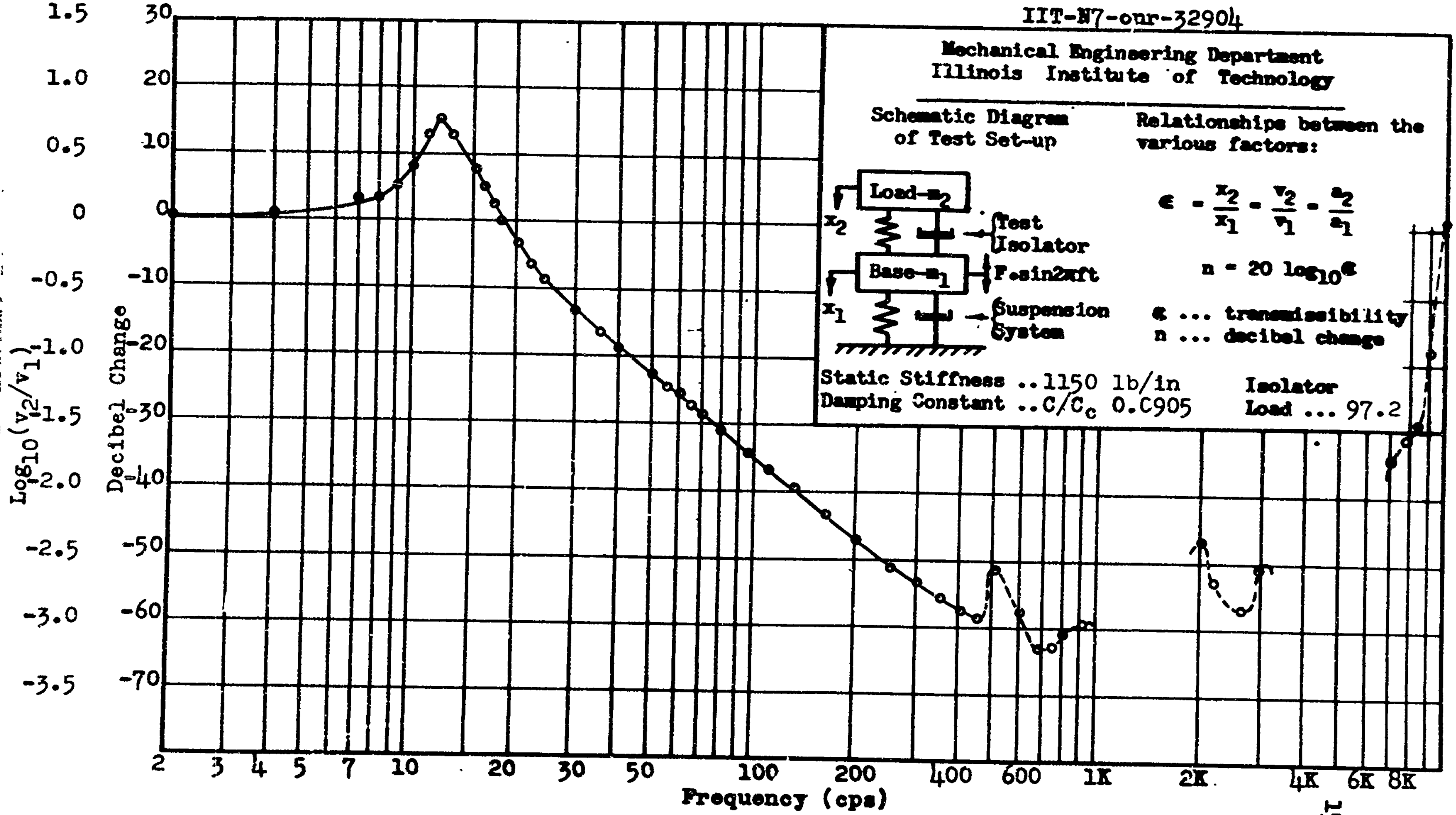
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Lord 279 PH 120

153L-b

IIT-N7-onr-32904

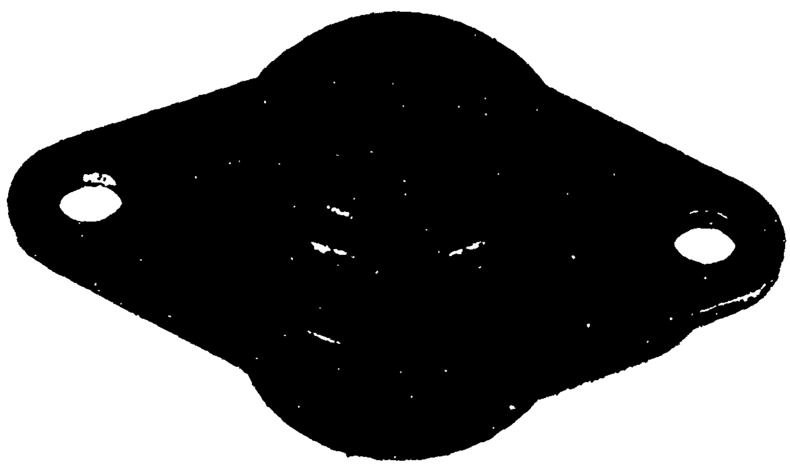


$\mathrm{Log}_{10}(v_2/v_1)$ vs Frequency Curve - Lord 279 PH 120

153L-c

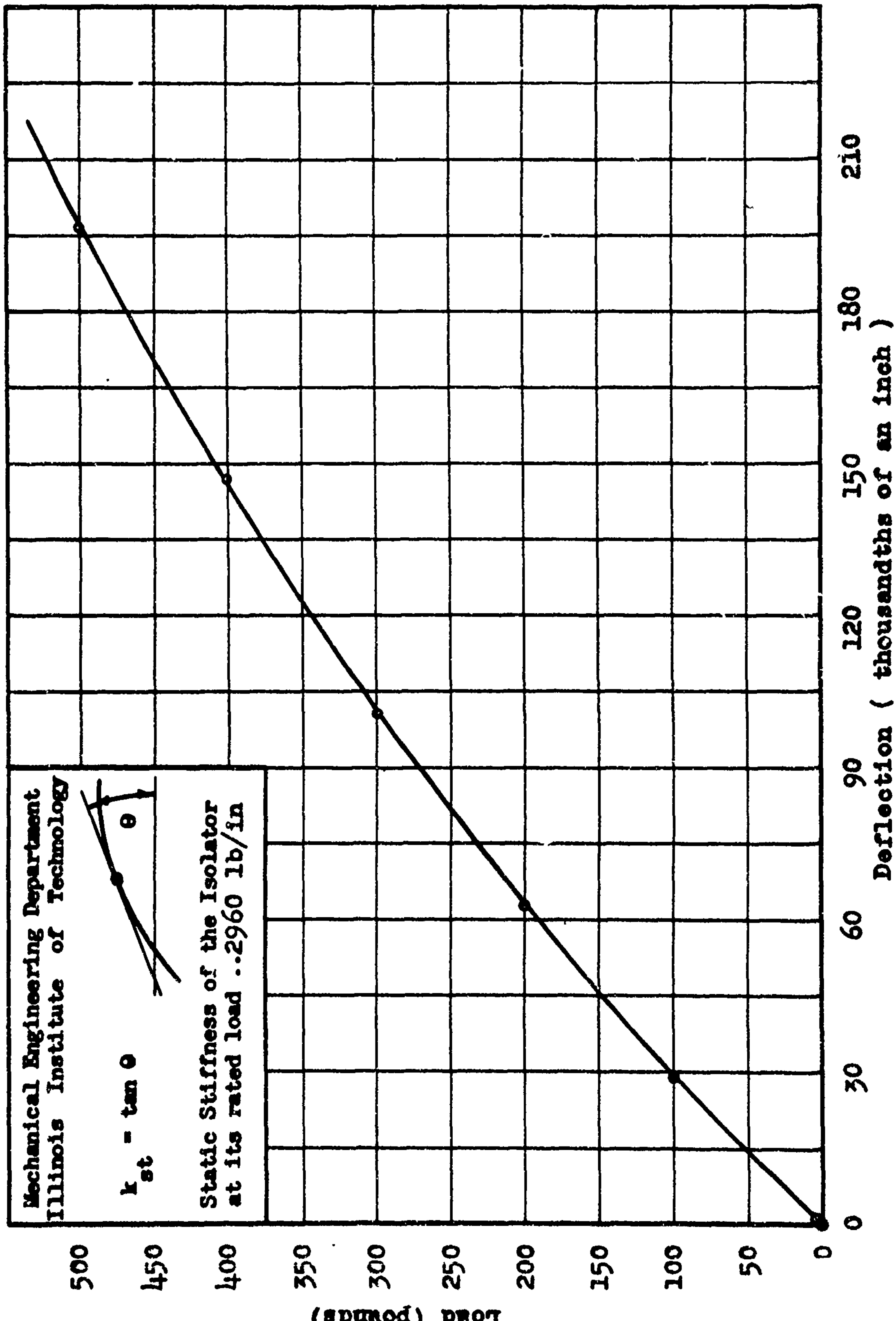
MB 508-C-26
154 M

HAMILTON-KENT H-150
157 H



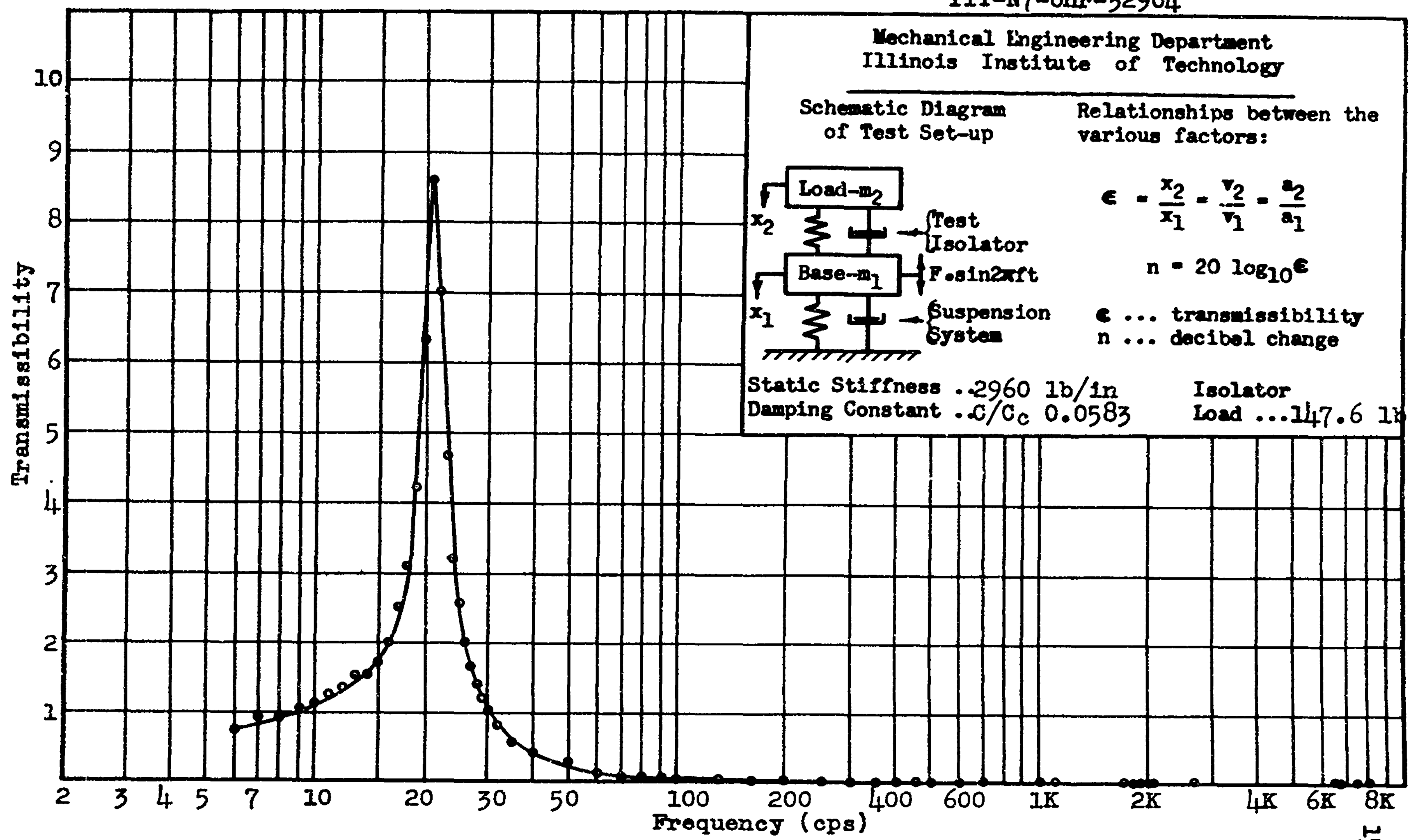
MB 508-C-32
171 M

PLATE VI-12



Load-Deflection Curve - MB 507 C 26

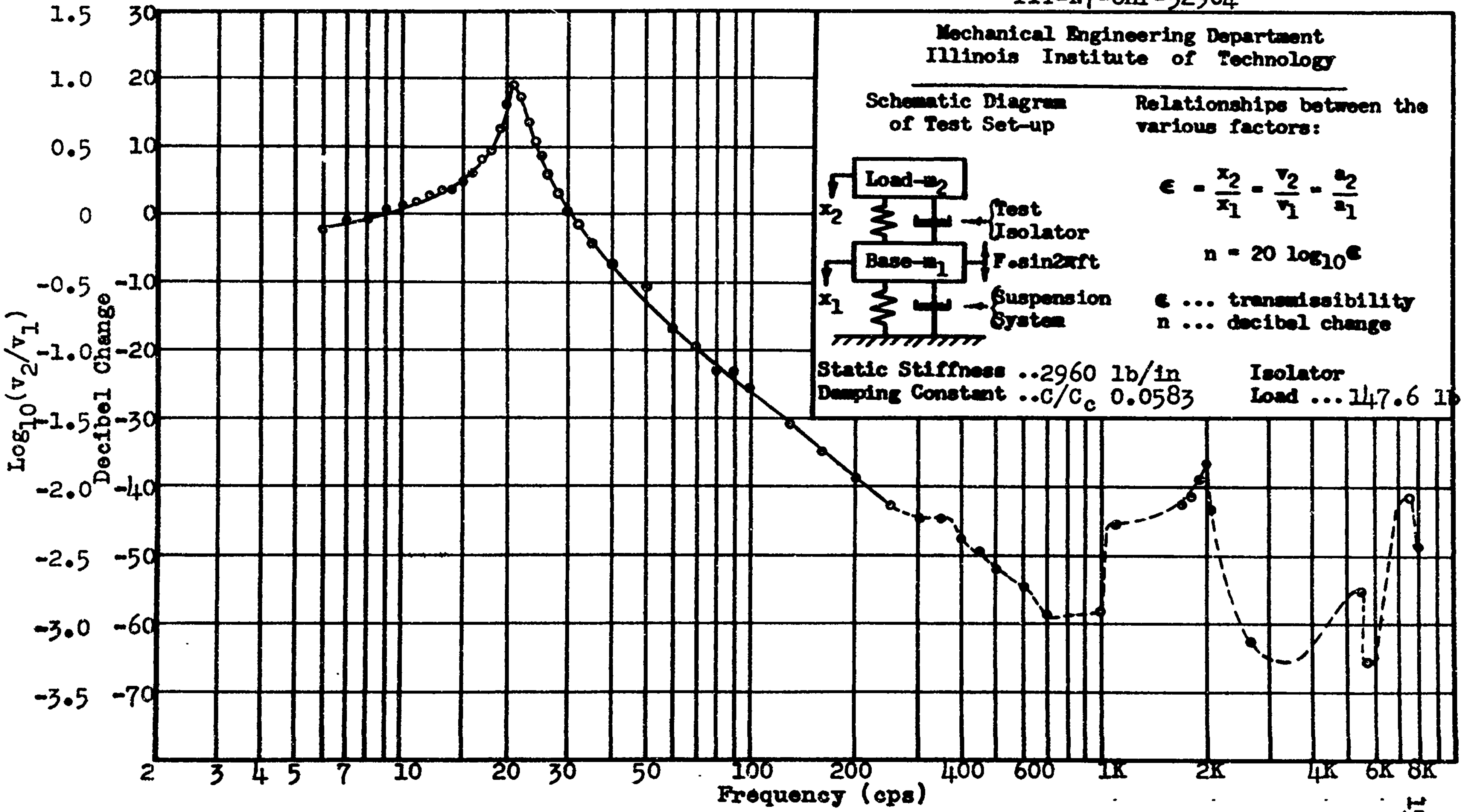
IIT-N7-onr-32904



Transmissibility vs Frequency Curve - MB 508C26

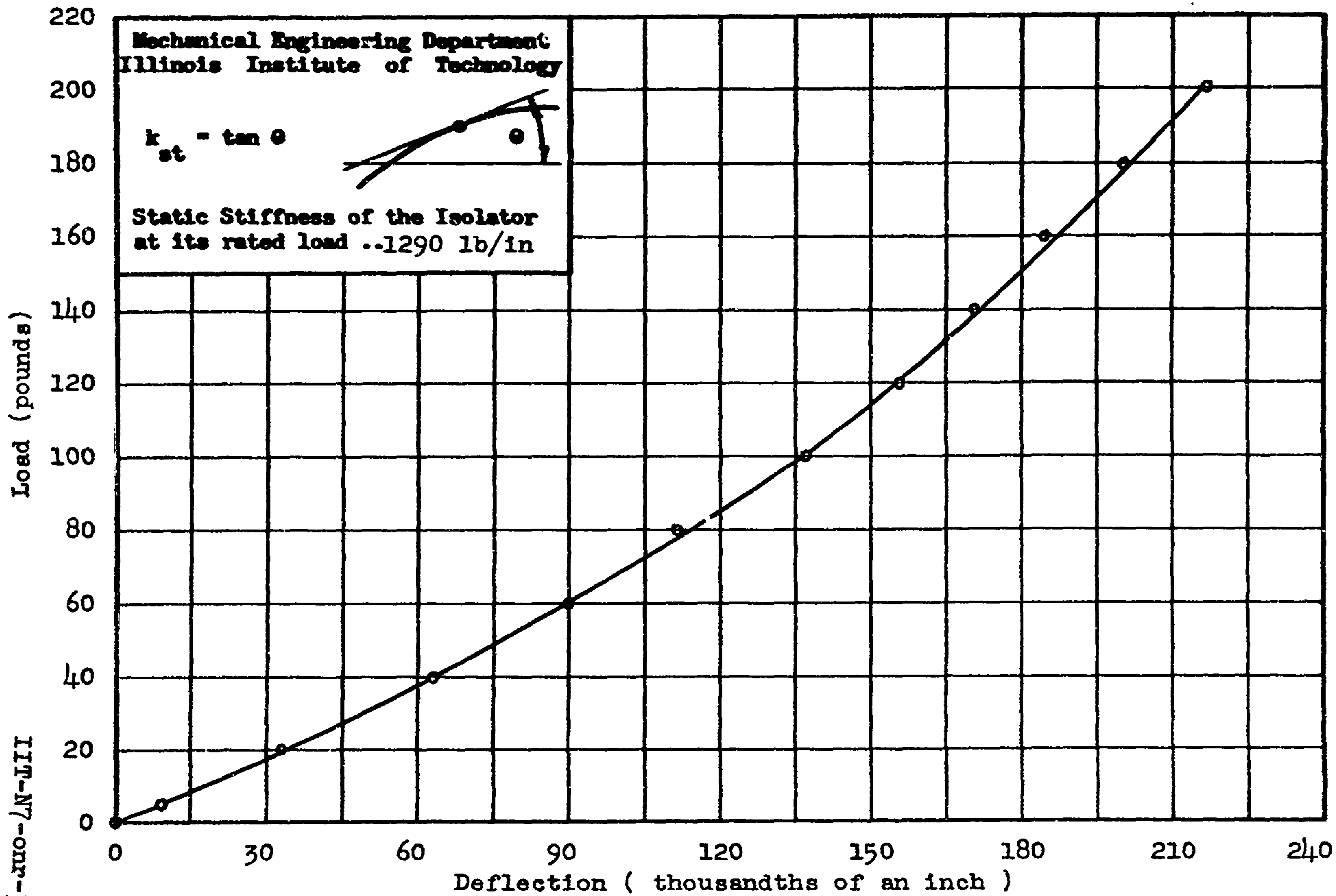
154M-b

IIT-N7-onr-32904

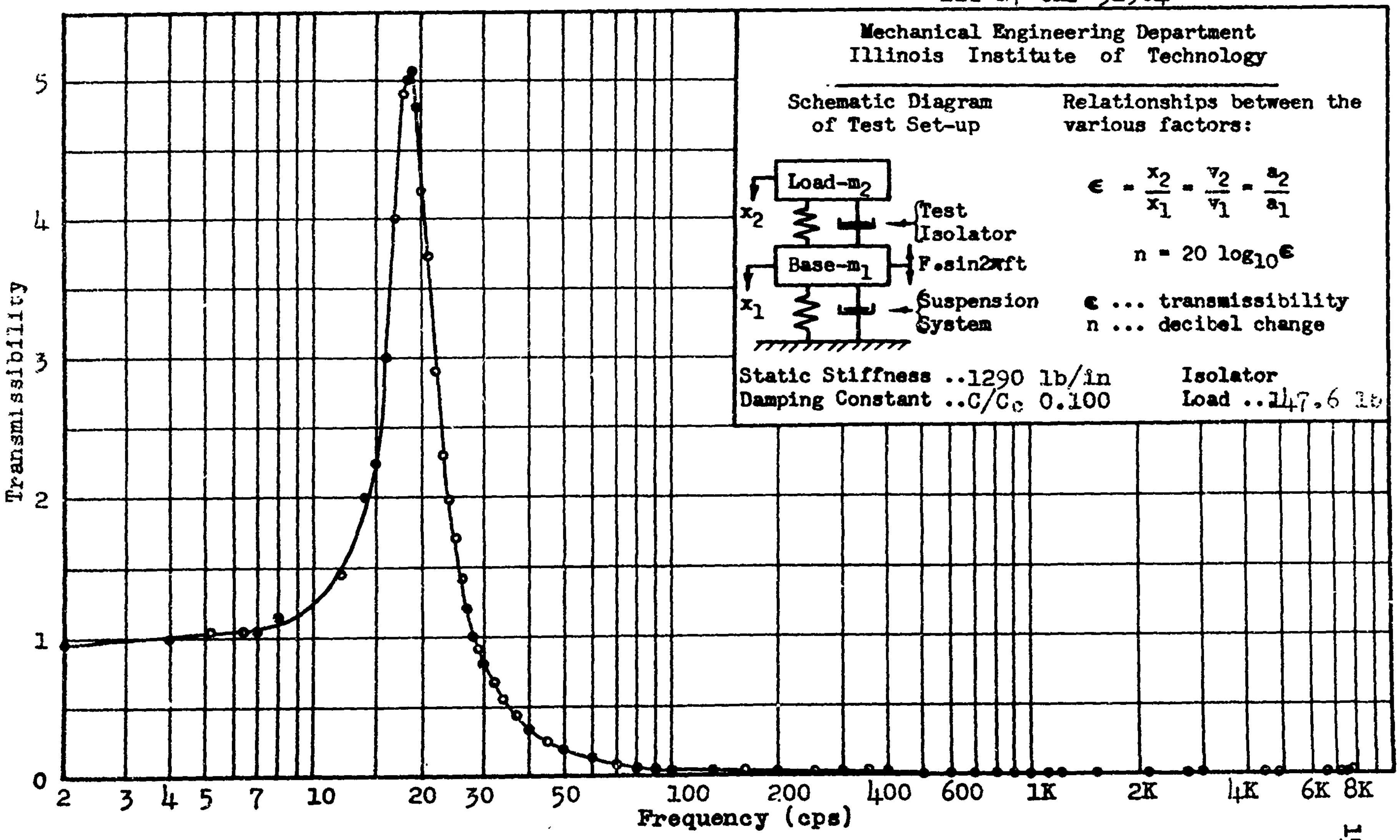


$Log_{10}(v_2/v_1)$ vs Frequency Curve - MB 508026

154M-c



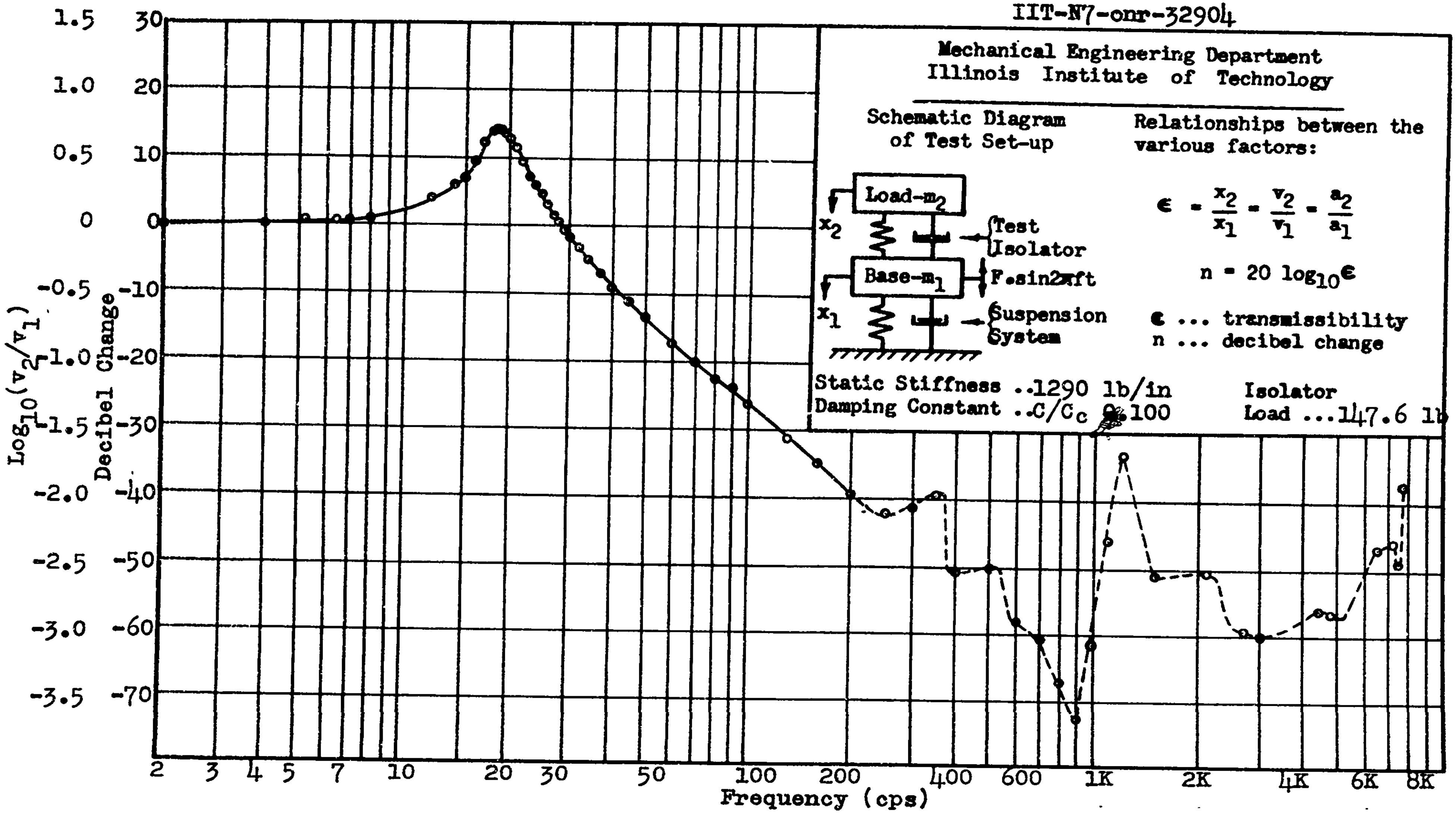
Load-Deflection Curve - Hamilton Kent H-150



Transmissibility vs Frequency Curve - Hamilton Kent H150

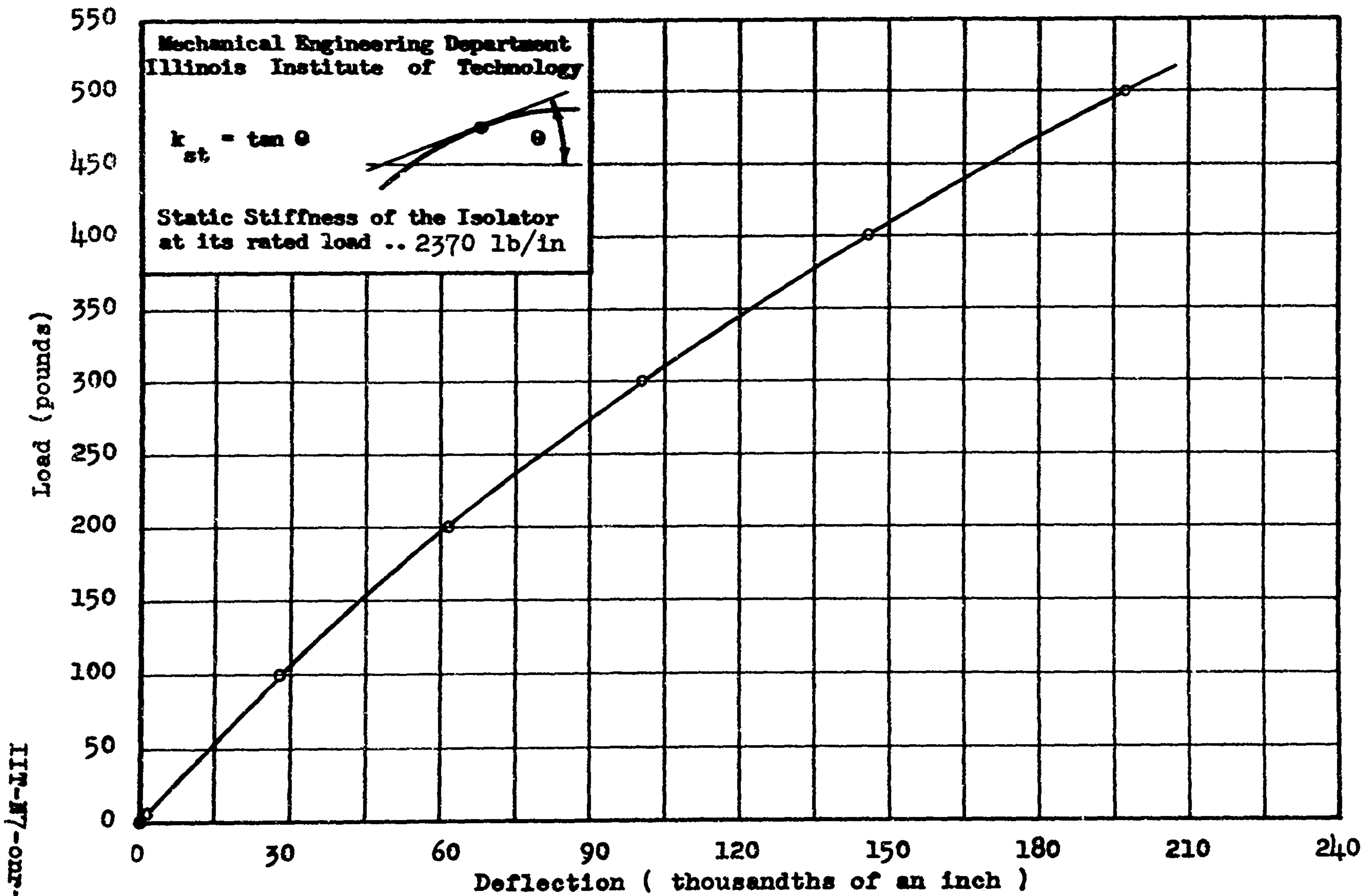
157H-b

IIT-N7-onr-32904

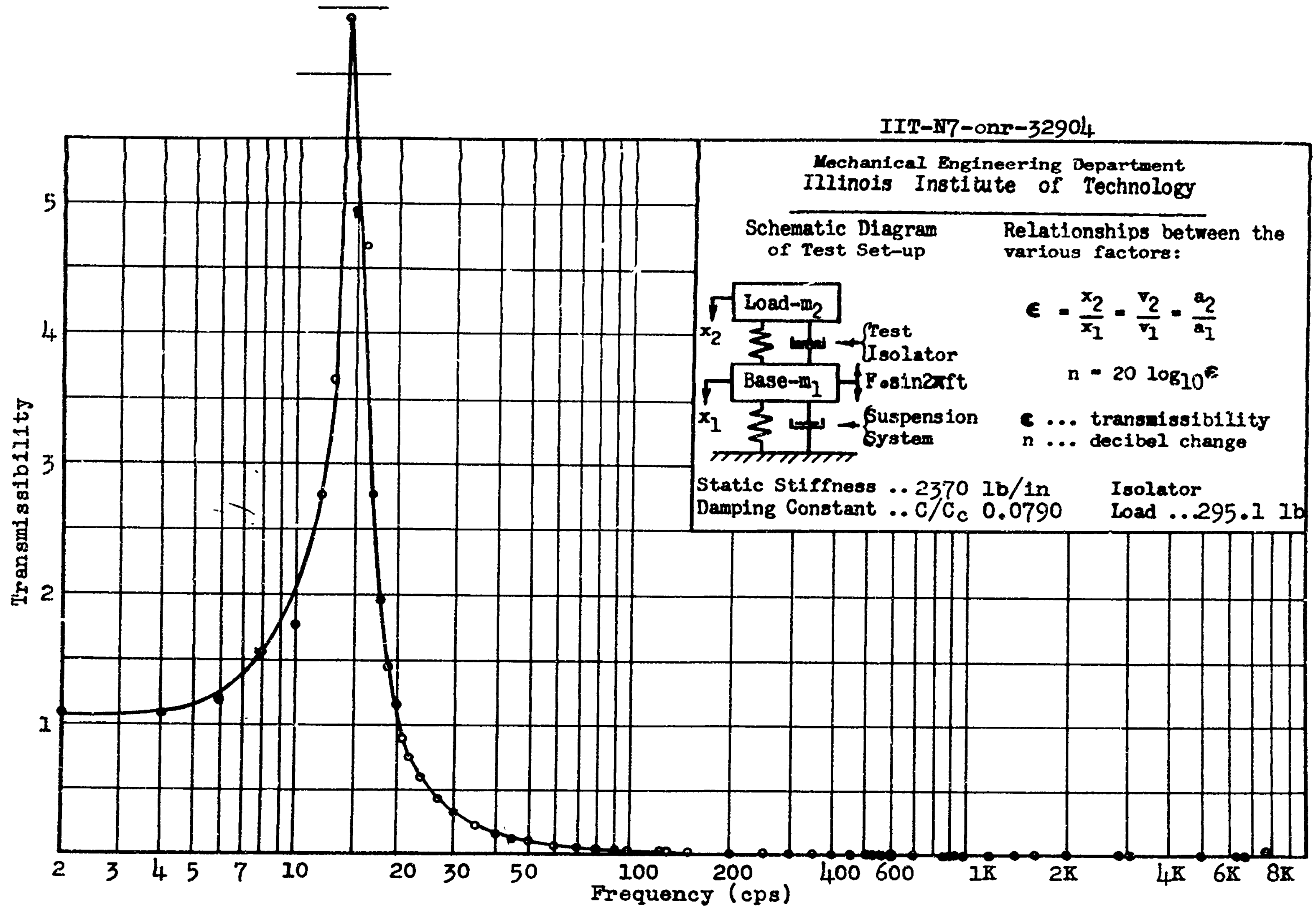


$\log_{10}(v_2/v_1)$ vs Frequency Curve - Hamilton Kent H150

157H-c

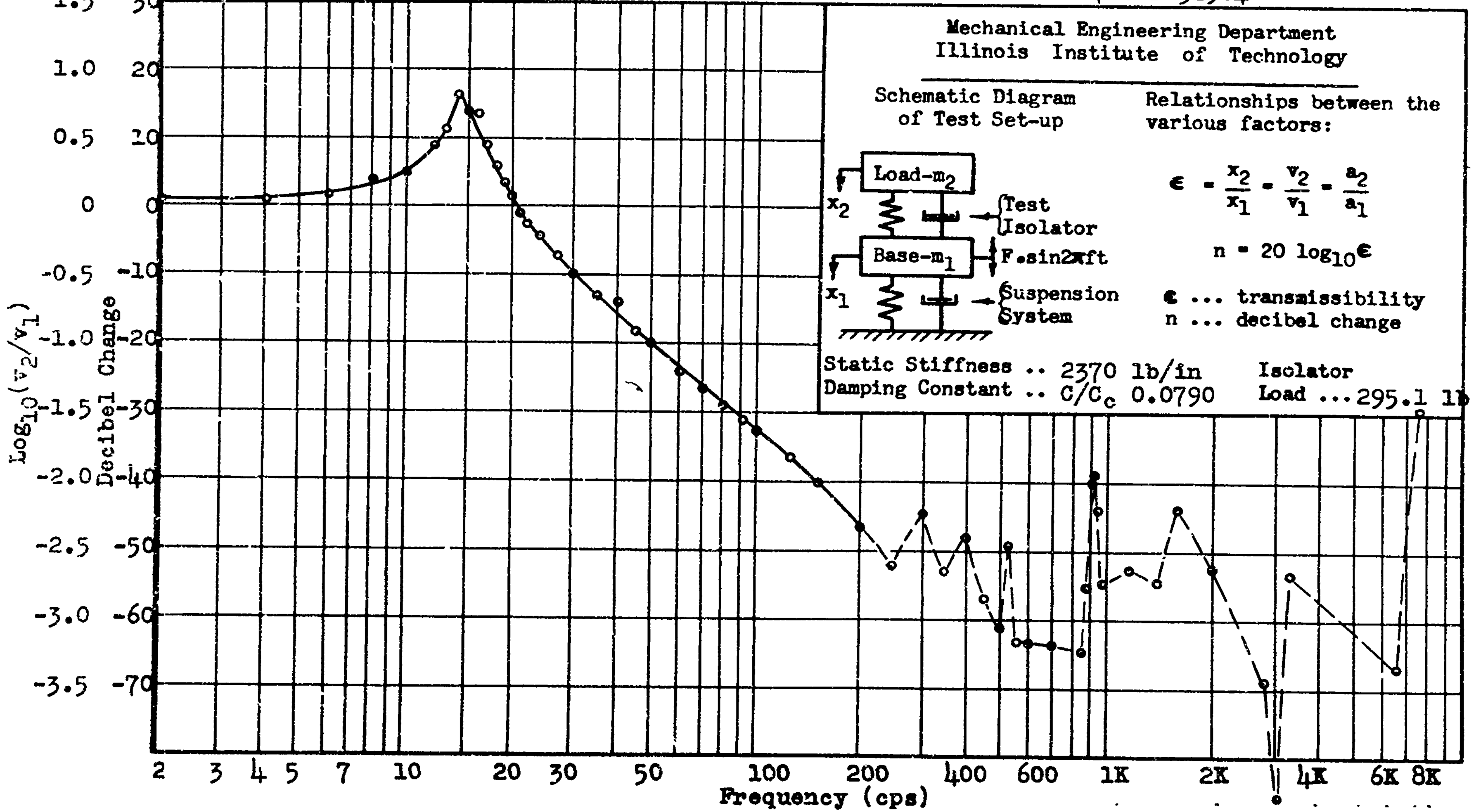


Load-Deflection Curve - MB 508 C 32



Transmissibility vs Frequency Curve - MB 508 C 32

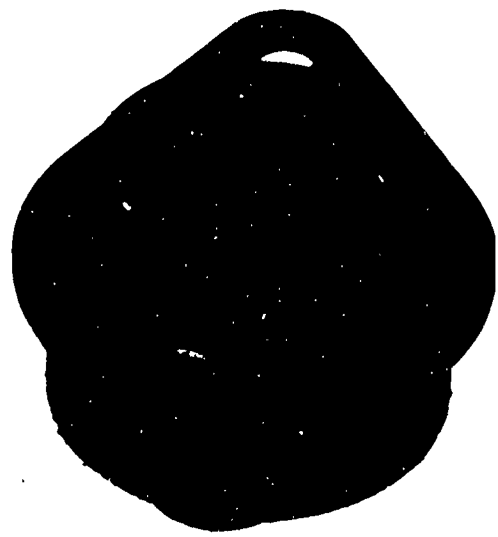
IIT-N7-onr-32904



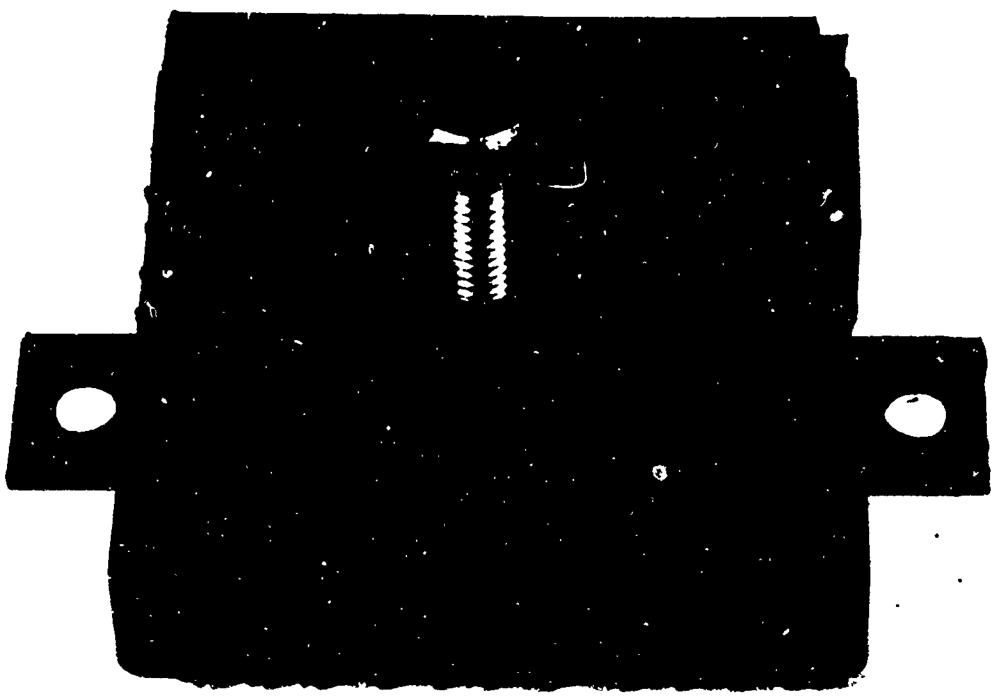
$Log_{10}(v_2/v_1)$ vs Frequency Curve - MB 508 C 32

171M-c

MB 510-C-32
172 M

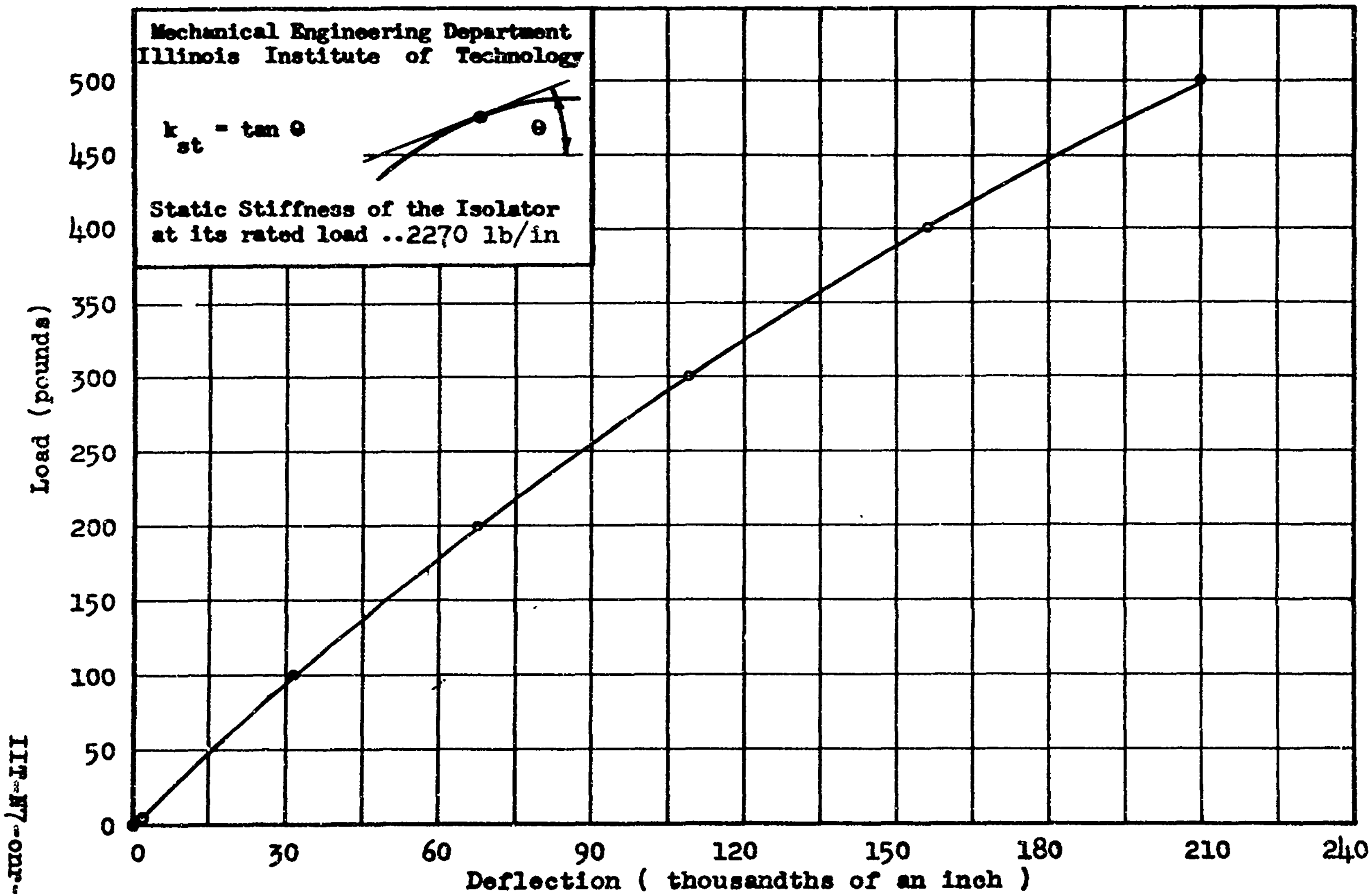


MB 510-C-38
173 M



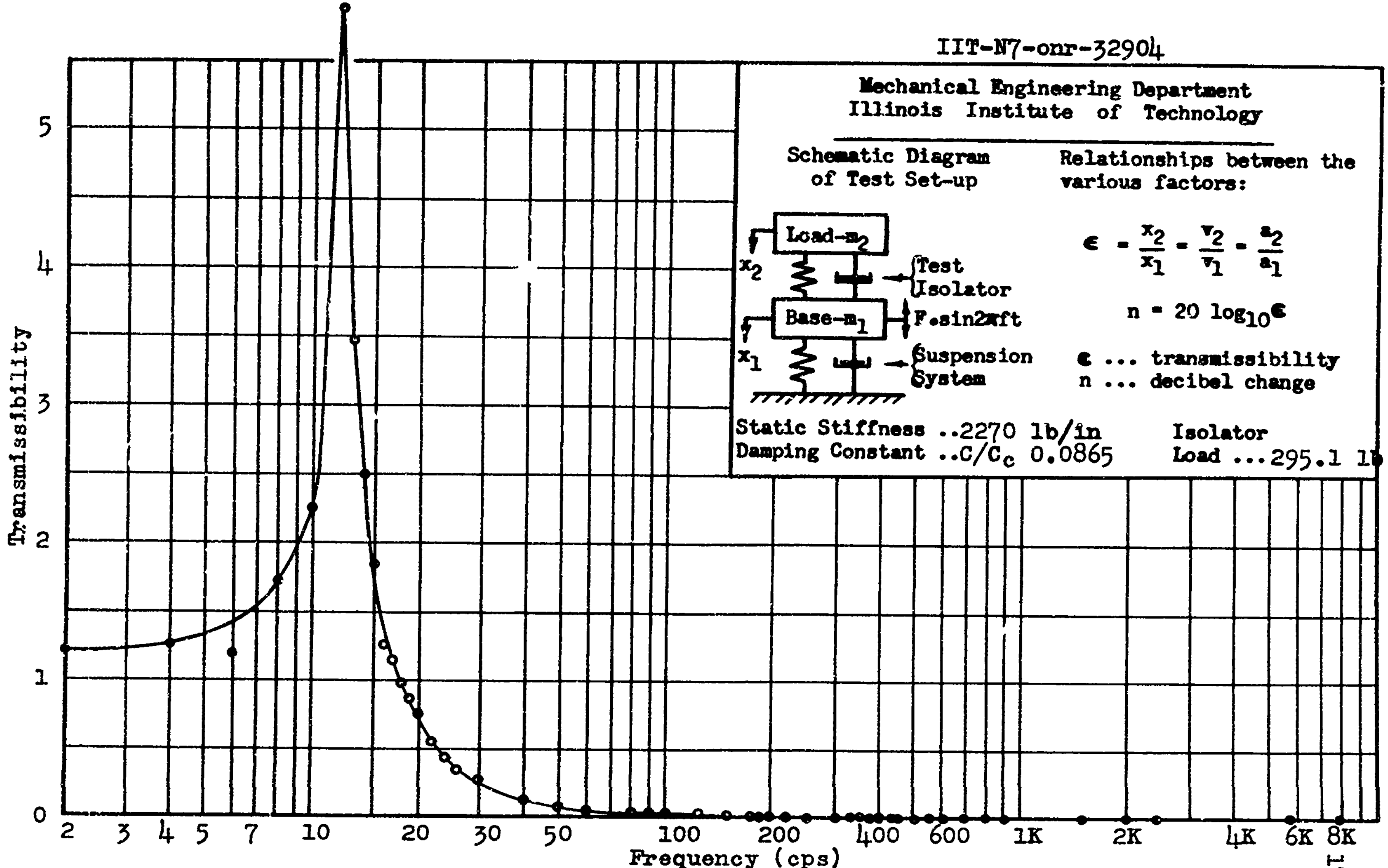
KORFUND ER/D-4
175 K

PLATE VI-13



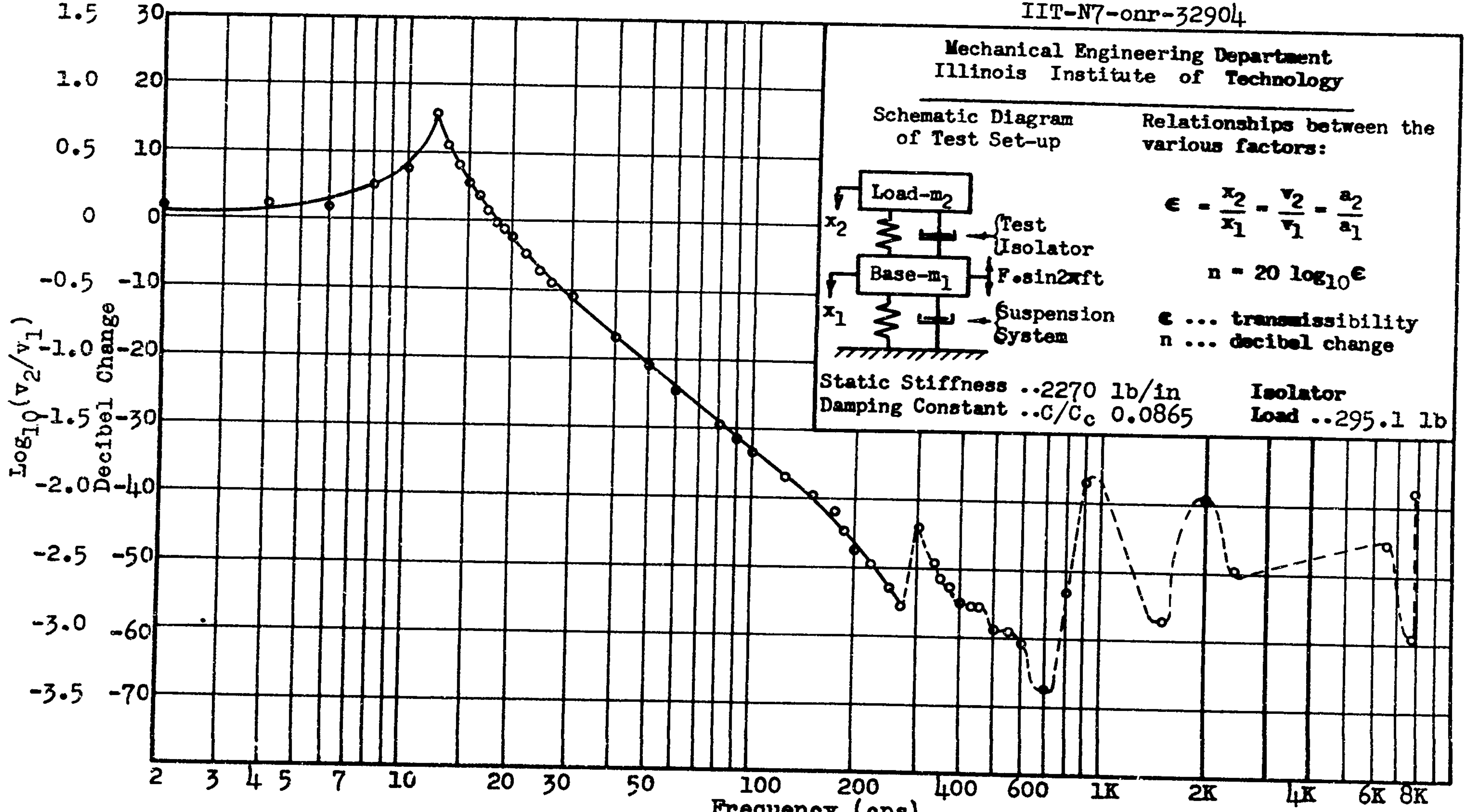
Load-Deflection Curve - MB 510 C 32

IIT-N7-onr-32904



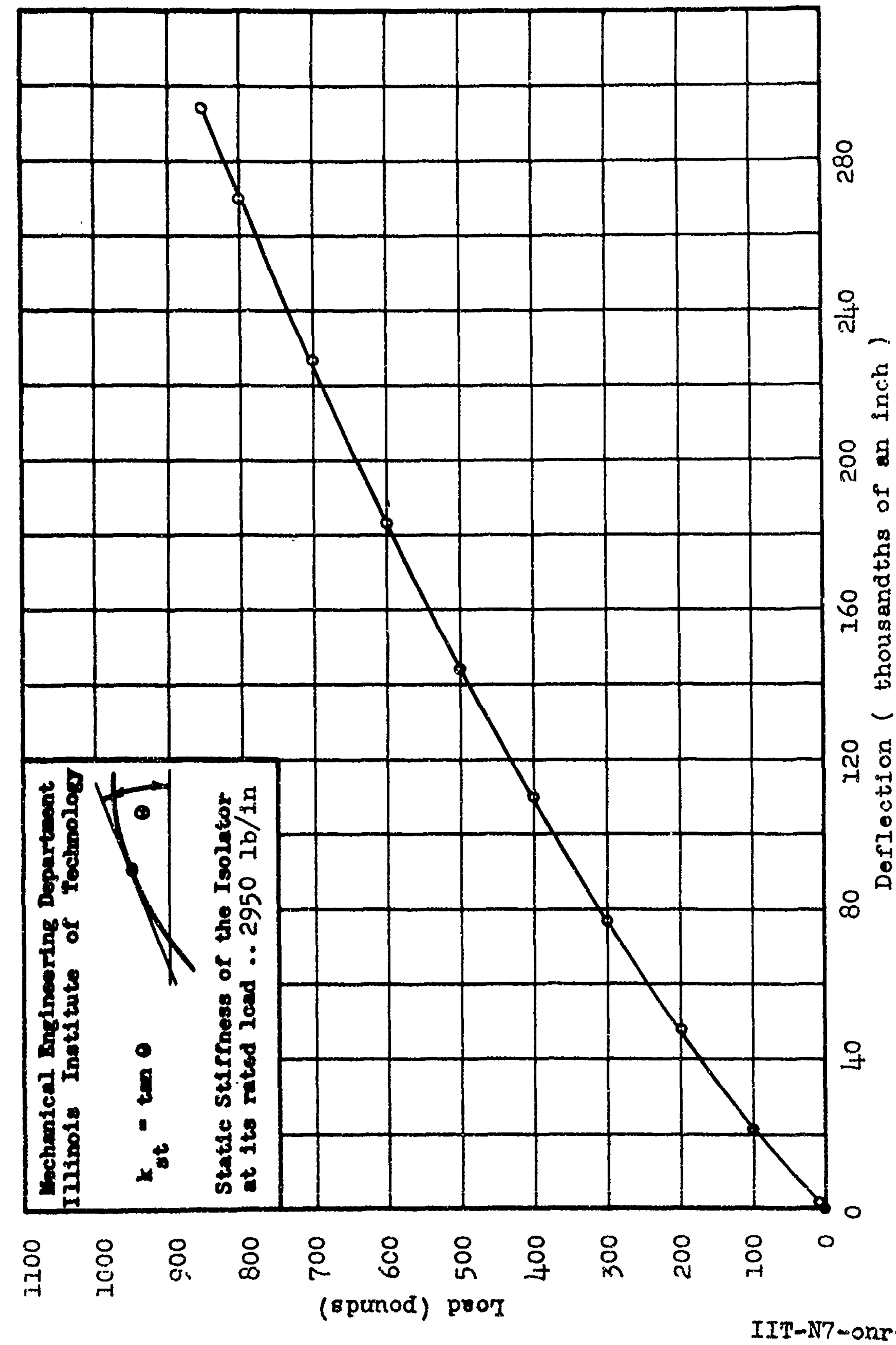
Transmissibility vs Frequency Curve - MB 510 C 32

172M-b

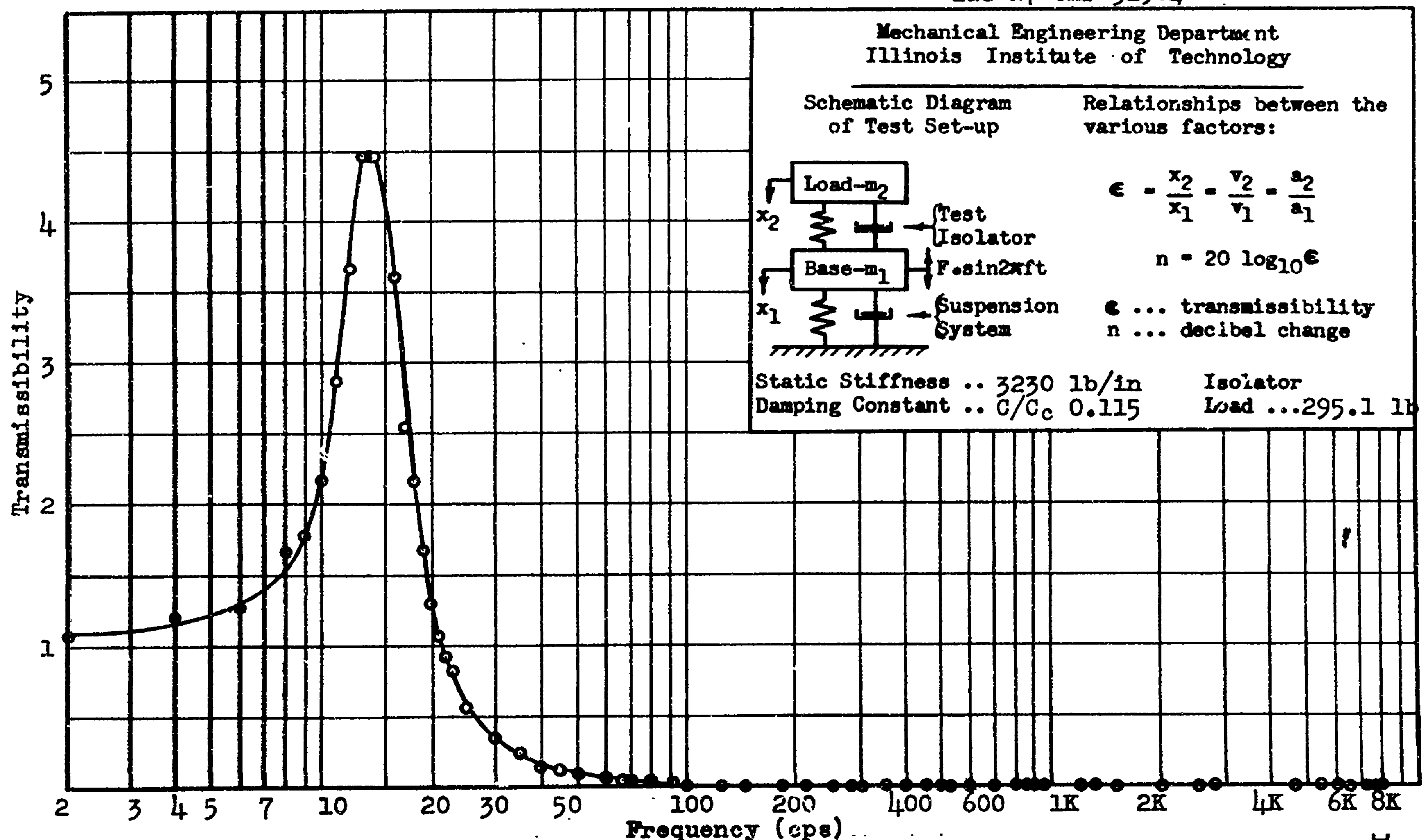


$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - MB 510 C 32

172M-c

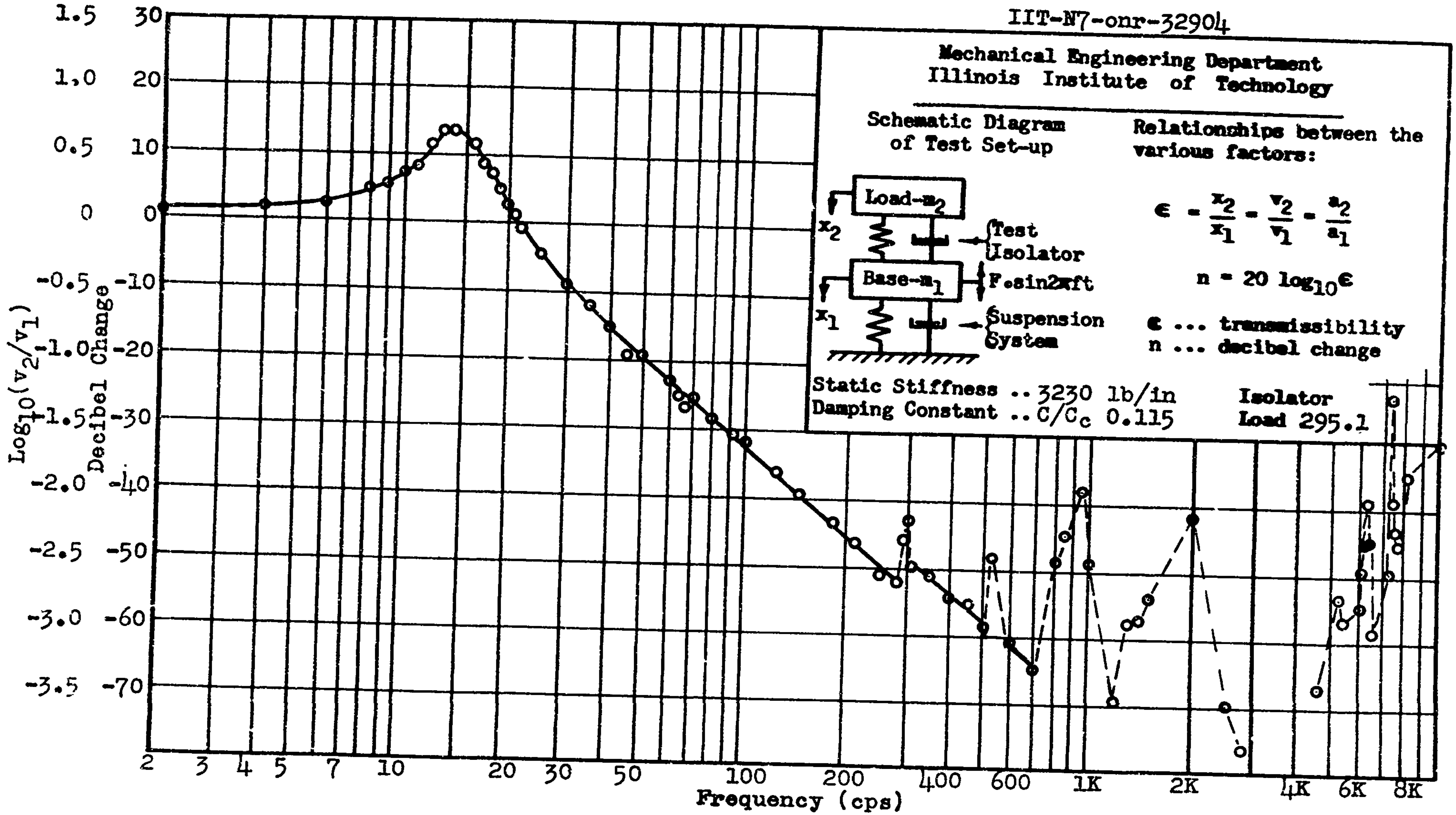


Load-Deflection Curve - MB 510 C 38



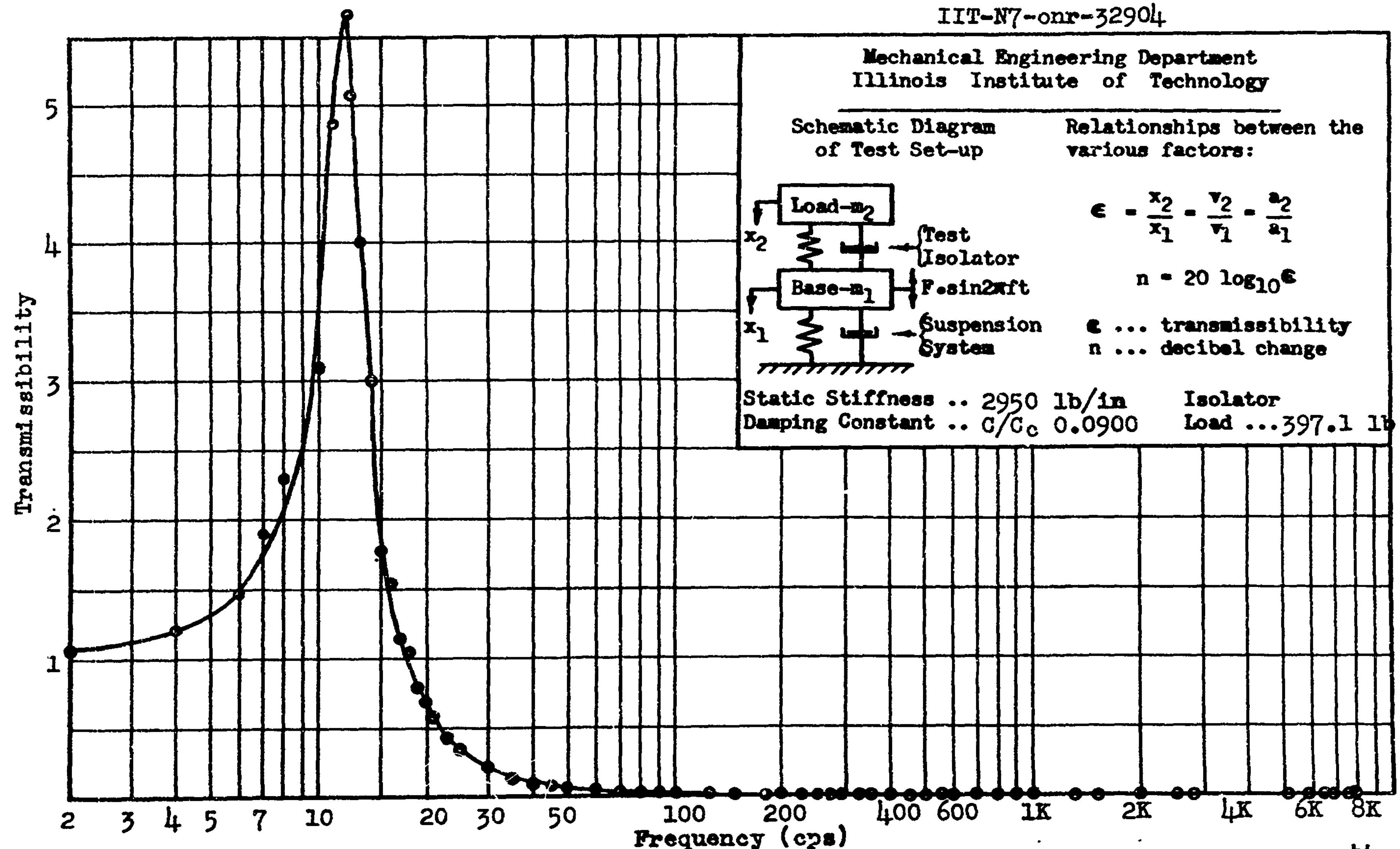
Transmissibility vs Frequency Curve - MB 510 C 38

173M-b



$\text{Log}_{10}(v_2/v_1)$ vs Frequency Curve - MB 510 C 38

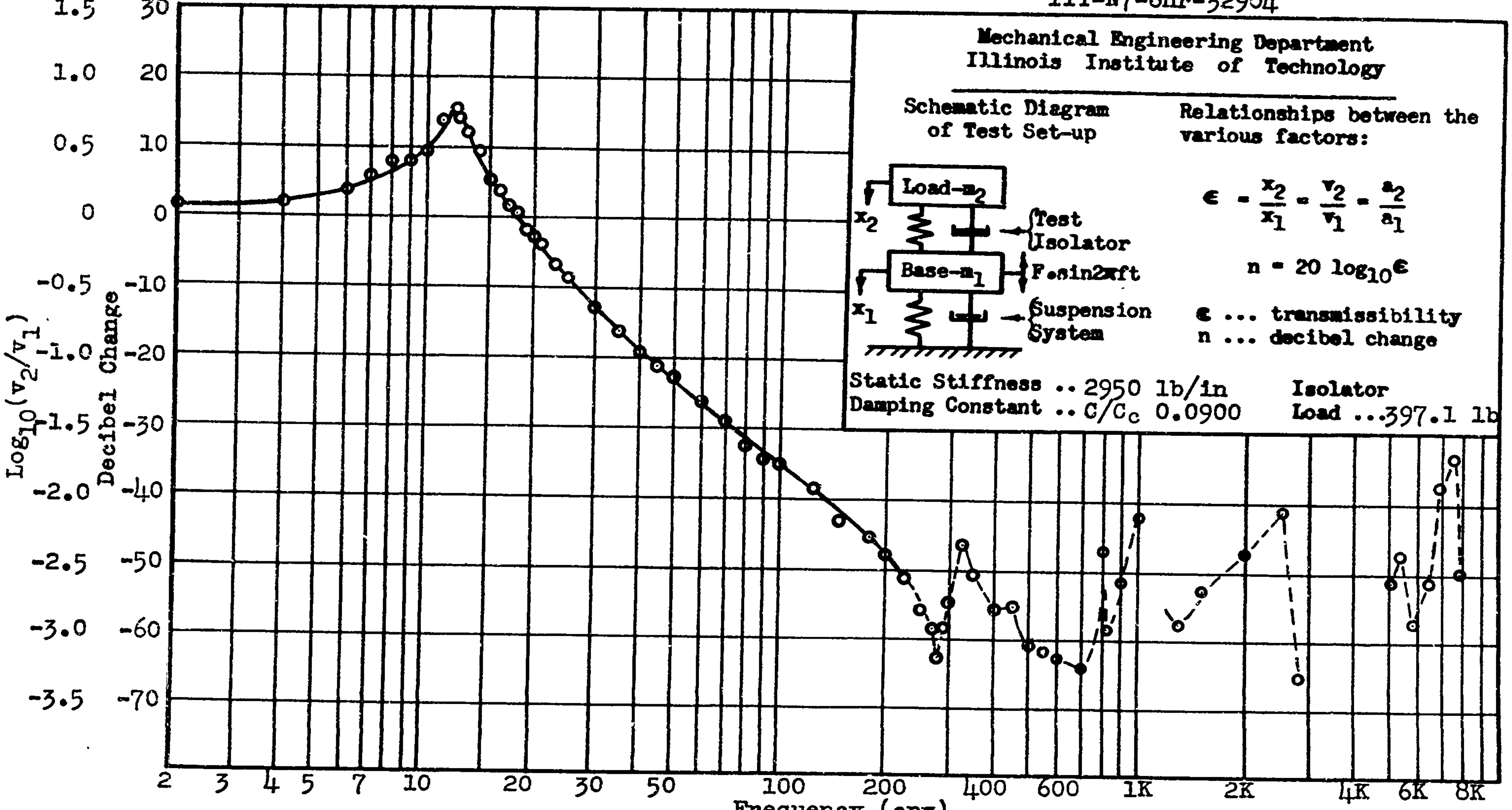
173M-c



Transmissibility vs Frequency Curve - MB 510 C 38

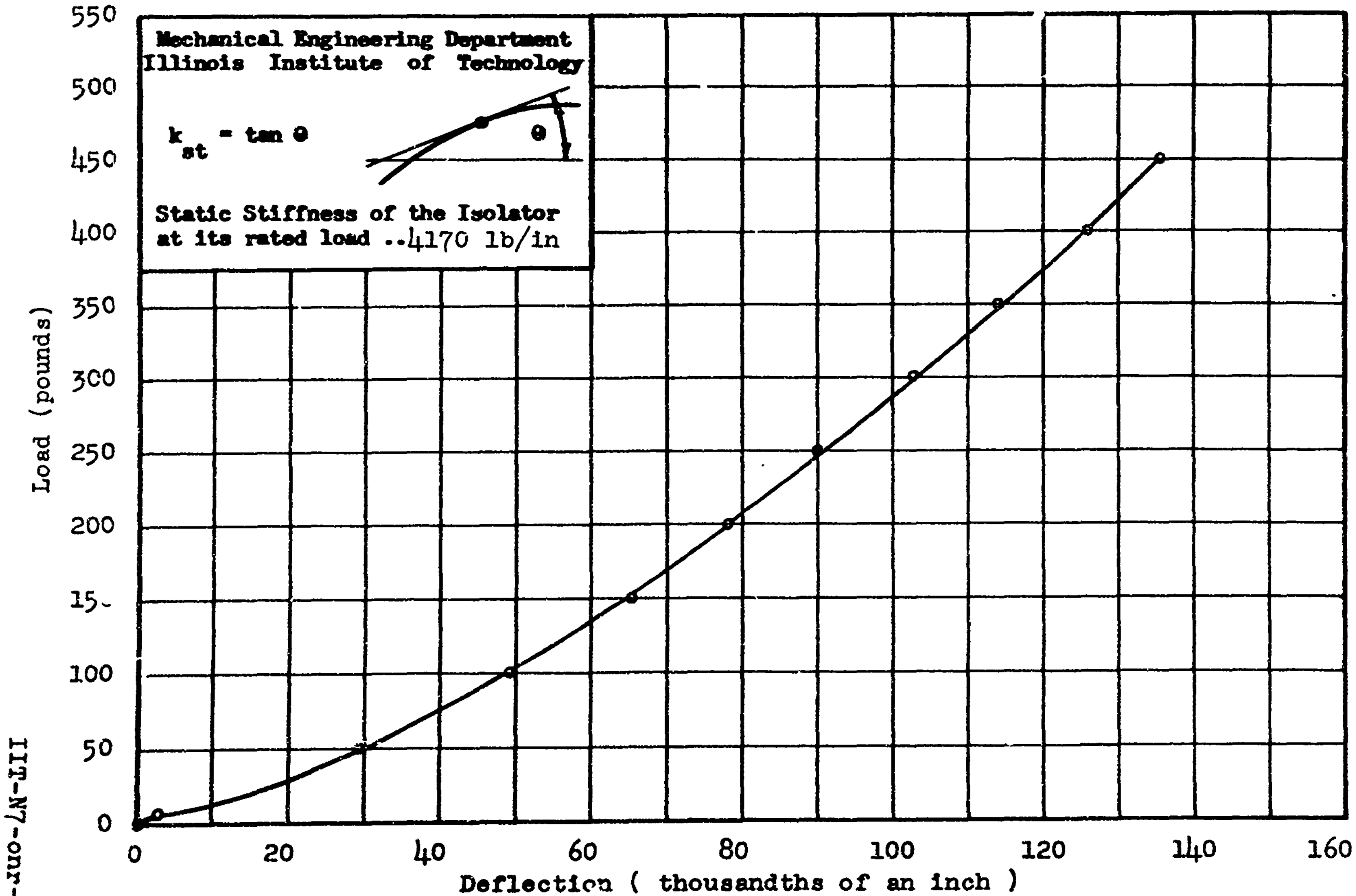
173M-b

IIT-N7-onr-32904



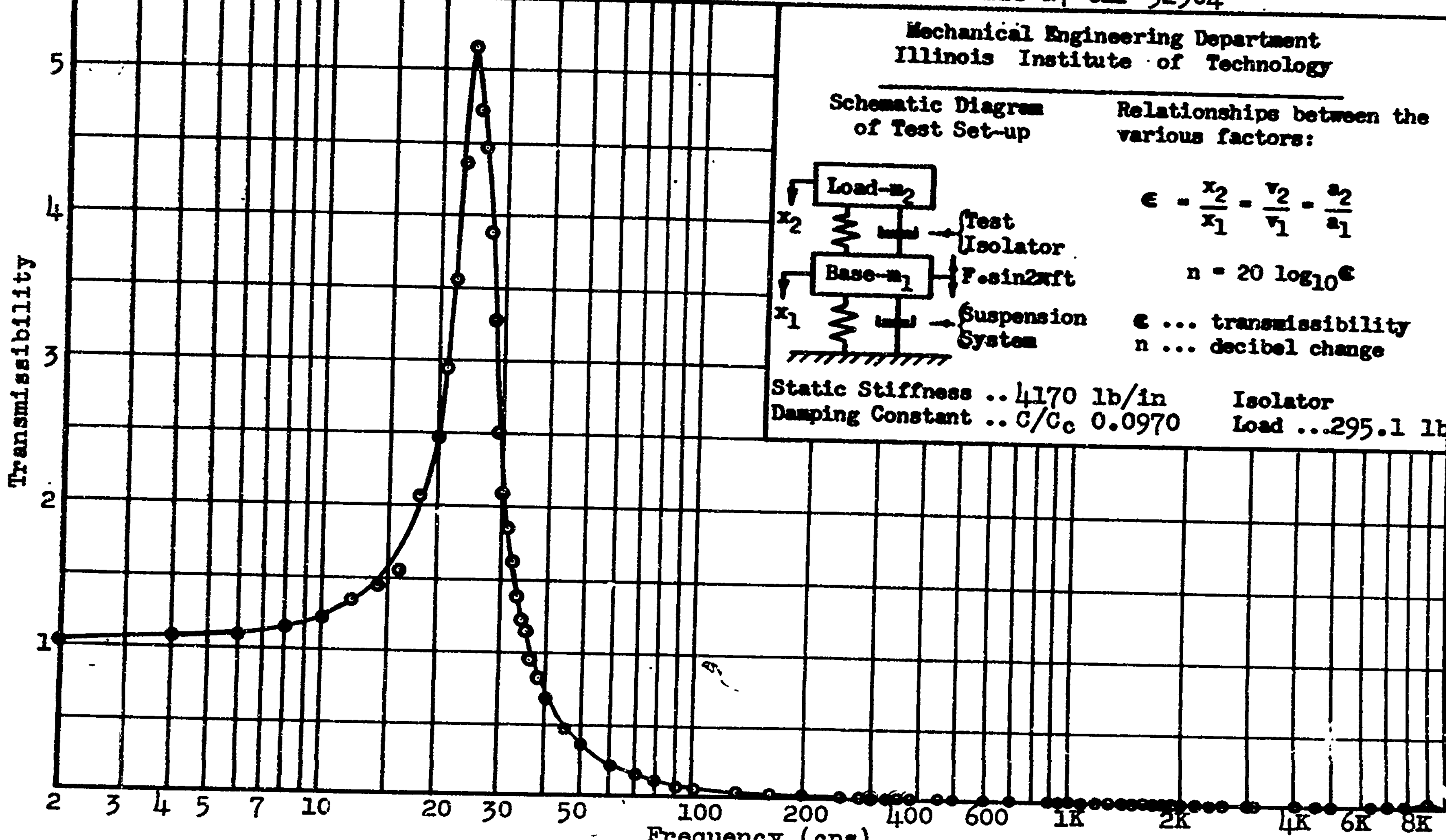
$\log_{10}(v_2/v_1)$ vs Frequency Curve - MB 510 C 38

173M-c



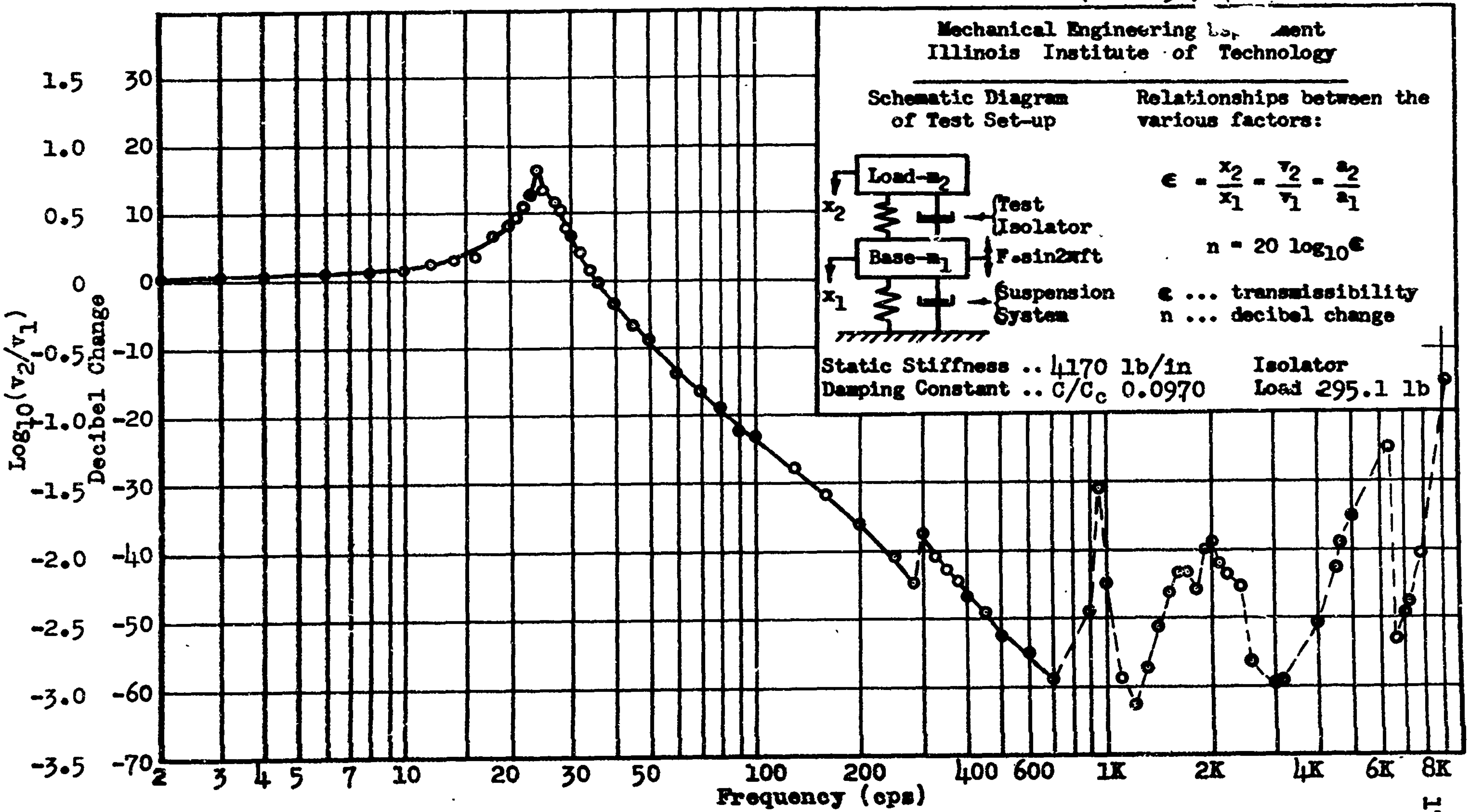
Load-Deflection Curve - Korfund ER/D-4

IIT-N7-onr-32904



Transmissibility vs Frequency Curve - Korfund ER/D4

175K-b



$\log_{10}(v_1/v_2)$ vs Frequency Curve - Korfund ER/D4

175K-c

Appendix E

Data

Note: In this appendix, all of the data taken during the tests are tabulated according to ascending isolator (test) number. These data have been represented graphically in the Appendix D.

2060
waa

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 150 PH4 Isolator
Rated Load 4 lbs.
Test Load 2.1 lbs.
April 26, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
8	1.00	0.0	1.79	5.0	5.0	1.79
10	1.00	0.0	1.59	4.0	4.0	1.59
12	1.00	0.0	1.78	4.9	4.9	1.78
13	1.00	0.0	1.99	5.9	5.9	1.99
14	1.00	0.0	2.30	7.3	7.3	2.30
15	1.00	0.0	2.79	8.9	8.9	2.79
16	1.00	0.0	3.80	11.6	11.6	3.80
17	1.00	0.0	5.15	14.4	14.4	5.15
17.5	1.00	0.0	7.90	18.0	18.0	7.90
18	1.00	0.0	10.0	20.0	20.0	10.0
18.5	1.00	0.0	13.5	22.6	22.6	13.5
19	1.00	0.0	12.0	21.6	21.6	12.0
20	1.00	0.0	6.65	16.5	16.5	6.65
21	1.00	0.0	4.10	12.3	12.3	[illegible].10
22	1.00	0.0	2.70	8.6	8.6	2.70
23	1.00	0.0	2.00	6.0	6.0	2.00
24	1.00	0.0	1.65	4.4	4.4	1.65
25	1.00	0.0	1.31	2.5	2.5	1.31
26	1.00	0.0	1.11	1.0	1.0	1.11
27	2.00	6.0	2.00	6.0	0.0	1.00
28	10.0	20.0	8.20	18.3	-1.7	.820
29	10.0	20.0	7.20	17.3	-2.7	.720
30	10.0	20.0	6.50	16.4	-3.6	.650
35	10.0	20.0	4.15	12.5	-7.5	.415
40	10.0	20.0	2.95	9.5	-10.5	.295
45	10.0	20.0	2.41	7.6	-12.4	.241
50	10.0	20.0	2.39	7.5	-12.5	.239
55	10.0	20.0	1.06	0.6	-19.4	.106
60	20.0	26.0	2.00	6.0	-20.0	.100
65	100	40.0	9.20	19.4	-20.6	.0920
70	100	40.0	8.90	19.0	-21.0	.0890
75	100	40.0	5.10	14.2	-25.8	.0510
80	100	40.0	4.70	13.5	-26.5	.0470
85	100	40.0	4.40	12.9	-27.1	.0440
90	100	40.0	3.70	11.4	-28.6	.0370
95	100	40.0	3.60	11.1	-23.9	.0360
100	100	40.0	3.35	10.6	-29.4	.0335
125	100	40.0	2.29	7.1	-32.9	.0229
150	100	40.0	1.50	3.5	-36.5	.0150

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 150 PH4 Isolator
Rated Load 4 lbs.
Test Load 2.1 lbs.
April 26, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
175	100	40.0	1.06	0.6	-39.4	.0106
200	316	50.0	2.70	8.6	-41.4	.00855
250	316	50.0	1.59	4.0	-46.0	.00504
300	300	49.6	1.10	0.9	-48.7	.00367
350	500	53.9	1.05	0.5	-53.4	.00210
400	400	52.1	1.90	5.6	-46.5	.00475
450	400	52.1	1.35	2.7	-49.4	.00338
500	400	52.1	1.00	0.0	-52.1	.00250
550	400	52.1	.520	-5.7	-57.8	.00130
600	400	52.1	.520	-5.7	-57.8	.00130
735	285	49.1	.300	-10.4	-59.5	.00105
775	280	49.0	.460	-6.7	-55.7	.00164
900	290	49.4	.440	-7.1	-56.5	.00152
940	285	49.1	.500	-6.1	-55.2	.00176
1200	316	50.0	.290	-10.7	-60.7	.000918
1300	365	51.2	.370	-8.6	-59.8	.00101
1575	540	54.5	1.00	0.0	-54.5	.00185
1750	840	58.5	1.55	3.7	-54.8	.00185
2000	9500	79.6	11.9	21.6	-58.0	.00125
2250	1000	60.0	1.20	1.6	-58.4	.00120
2800	330	50.5	.270	-11.4	-61.9	.000819
3250	245	47.8	.445	-7.0	-54.8	.00182
3600	320	50.1	.580	-4.9	-55.0	.00181
3650	260	48.4	3.30	10.4	-38.0	.0127
4000	285	49.1	.640	-3.9	-53.0	.00225
4200	320	50.1	1.00	0.0	-50.1	.00312
4350	620	55.9	1.35	2.7	-53.2	.00218
5200	170	44.6	.445	-7.0	-51.6	.00262
6400	1210	61.7	.355	-9.0	-70.7	.000294
7800	1220	62.0	.260	-11.6	-73.6	.000213
8800	700	56.9	.250	-12.0	-68.9	.000357
8900	330	50.5	1.11	1.0	-49.5	.00336
11500	22.0	26.9	1.05	0.5	-26.4	.0477

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 150 PH4 Isolator
Rated Load 4 lbs.
Test Load 2.1 lbs.
April 26, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
1	14.5
2	29.5
3	45.5
4	62.5
5	79.5
6	97.0
8	129.5

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

4.0 thousandths of an inch
2.5 after ½ minute
2.0 after 1 minute
1.7 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -19 db and -24 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 236-10 Isolator
Rated Load 5-10 lbs.
Test Load 10 lbs.
April 27, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver Millivolts	db	Weight Millivolts	db		
7	1.00	0.0	2.09	6.4	6.4	2.09
8	1.00	0.0	2.48	7.9	7.9	2.48
9	1.00	0.0	2.59	8.3	8.3	2.59
10	1.00	0.0	3.38	10.7	10.7	3.38
11	1.00	0.0	5.05	14.1	14.1	5.05
11.5	1.00	0.0	6.42	16.3	16.3	6.42
11.75	1.00	0.0	7.10	17.0	17.0	7.10
12	1.00	0.0	7.38	17.3	17.3	7.38
12.25	1.00	0.0	7.26	17.2	17.2	7.26
12.5	1.00	0.0	6.65	16.6	16.6	6.65
13	1.00	0.0	5.20	14.3	14.3	5.20
14	1.00	0.0	3.32	10.5	10.5	3.32
15	1.00	0.0	2.33	6.3	6.3	2.33
16	1.00	0.0	1.69	4.6	4.6	1.69
17	1.00	0.0	1.32	2.5	2.5	1.32
18	1.00	0.0	1.06	0.6	0.6	1.06
19	2.00	6.0	1.67	4.4	-1.6	.835
20	2.00	6.0	1.41	3.0	-3.0	.705
21	2.00	6.0	1.22	1.8	-4.2	.610
22	2.00	6.0	1.05	0.5	-5.5	.525
25	3.00	9.6	1.10	0.9	-9.7	.367
30	5.00	13.9	1.17	1.5	-12.4	.234
35	7.00	15.9	1.12	1.2	-14.7	.160
40	10.0	20.0	1.26	2.1	-17.9	.126
45	20.0	26.0	1.86	5.4	-20.6	.0930
50	20.0	26.0	1.60	4.1	-21.9	.0800
60	20.0	26.0	1.10	0.9	-25.1	.0550
70	25.0	28.0	1.00	0.0	-28.0	.0250
80	40.0	32.1	1.17	1.5	-30.6	.0293
90	50.0	33.9	1.28	2.3	-31.6	.0256
100	50.0	33.9	1.00	0.0	-33.9	.0200
125	100	40.0	1.34	2.7	-37.3	.0134
150	100	40.0	1.00	0.0	-40.0	.0100
175	200	46.0	1.55	3.8	-42.2	.00775
200	200	46.0	1.27	2.2	-43.8	.00635
250	250	48.0	1.12	1.1	-46.9	.00448
300	300	49.6	1.09	0.8	-48.8	.00363
350	400	52.1	1.26	2.2	-49.9	.00315
400	400	52.1	1.09	0.8	-51.3	.00272

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 236-10 Isolator
Rated Load 5-10 lbs.
Test Load 10 lbs.
April 27, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weights			
	Millivolts	db	Millivolts	db		
450	400	52.1	1.10	0.9	-51.2	.00275
500	200	46.0	.680	-3.3	-49.3	.00340
600	300	49.6	1.17	1.5	-48.1	.00390
800	300	49.6	.840	-1.5	-51.1	.00280
900	279	48.9	.560	-5.1	-54.0	.00205
1000	300	49.6	.575	-4.8	-54.4	.00192
1165	340	50.7	.565	-5.0	-55.7	.00166
1250	400	52.1	.360	-8.8	-60.9	.000900
1440	400	52.1	1.15	1.4	-50.7	.00288
1530	400	52.1	.383	-8.3	-60.4	.000958
1600	536	54.6	.250	-12.0	-66.6	.000467
1800	1690	64.8	1.03	0.3	-64.5	.000610
1900	3000	69.6	2.29	7.1	-62.5	.000763
1950	5000	73.9	3.10	9.9	-64.0	.000620
2000	2000	66.0	1.96	5.8	-60.2	.000980
2060	200	46.0	1.24	1.9	-44.1	.00620
2100	3000	69.6	5.86	15.4	-54.2	.00175
2200	2000	66.0	1.93	5.8	-60.2	.000965
2300	1430	63.2	.665	-3.5	-66.7	.000465
2400	645	56.3	.275	-11.2	-67.5	.000427
2600	628	56.0	.261	-11.7	-67.7	.000416
2880	492	53.8	.270	-11.3	-65.1	.000549
3950	405	52.2	.235	-12.6	-64.8	.000827
4110	865	58.7	.458	-6.8	-65.5	.000535
6300	718	57.1	.295	-10.6	-67.7	.000411
6560	333	50.6	.610	-4.2	-54.8	.00183
7100	2320	67.4	.172	-17.3	-84.7	.0000742
7160	2940	69.3	.375	-8.5	-77.8	.000128
7770	1200	61.7	.380	-8.3	-70.0	.000316
7900	860	58.7	1.61	4.1	-54.6	.00187
8000	600	55.6	1.70	4.6	-51.0	.00284
8640	680	56.7	.810	-1.8	-58.5	.00119
8840	209	46.4	.780	-2.1	-48.5	.00373
9160	143	43.2	.605	-6.3	-49.5	.00423
9640	73.9	37.4	6.85	16.6	-20.6	.0927
10,000	566	55.0	1.62	4.2	-50.8	.00286
10,600	890	59.0	1.18	1.6	-57.4	.00133
12,000	123	41.8	1.00	0.0	-41.8	.00813
12,700	225	47.1	.610	-4.2	-51.3	.00271

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 236-10 Isolator
Rated Load 5-10 lbs.
Test Load 10 lbs.
April 27, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
2	3.0
4	12.0
6	29.3
8	55.5
10	81.5
12	109.0
14	138.5
15	154.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

7.5 thousandths of an inch
4.5 after ½ minute
3.7 after 1 minute
2.7 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -16 db and -21 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 104-10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
March 27, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	10.7	10.5	-0.2	0.980
4	10.3	10.7	0.3	1.04
6	10.3	11.3	1.0	1.10
8	10.7	15.3	3.1	1.43
9	10.9	18.0	4.3	1.65

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
10	1.00	0.0	4.90	13.8	13.8	4.90
10.5	1.00	0.0	6.90	15.8	15.8	6.90
11	1.00	0.0	11.8	21.6	21.6	11.8
11.5	.455	-6.8	10.0	20.0	26.8	22.0
11.8	.395	-8.0	10.7	20.7	28.7	27.1
12	.395	-8.0	9.50	19.6	27.6	24.0
13	1.00	0.0	6.95	16.8	16.8	6.95
14	1.00	0.0	3.72	11.6	11.6	3.72
15	1.00	0.0	2.58	8.2	8.2	2.58
16	1.00	0.0	1.90	5.6	5.6	1.90
17	1.00	0.0	1.47	3.4	3.4	1.47
18	1.00	0.0	1.18	1.6	1.6	1.18
19	2.00	6.0	1.92	5.7	-0.3	0.960
20	2.00	6.0	1.60	4.1	-1.9	.800
21	2.00	6.0	1.43	3.2	-2.8	.715
22	2.00	6.0	1.26	2.1	-3.9	.630
23	2.00	6.0	1.10	1.0	-5.0	.555
24	2.50	8.0	1.23	2.0	-6.0	.492
25	2.50	8.0	1.11	1.0	-7.0	.444
27	3.00	9.6	1.08	0.8	-8.8	.360
30	4.00	12.1	1.11	1.0	-11.1	.277
35	6.00	15.6	1.17	1.5	-14.1	.195
40	7.00	16.8	1.02	0.2	-16.6	.146
45	10.0	20.0	1.13	1.2	-18.8	.113
50	20.0	26.0	1.90	5.6	-20.4	.0950
60	20.0	26.0	1.30	2.4	-23.6	.0650
70	20.0	26.0	1.00	0.0	-26.0	.0500
80	30.0	29.6	1.05	0.5	-29.1	.0350
90	70.0	36.9	2.00	6.0	-30.9	.0286
100	88.0	38.8	2.00	6.0	-32.8	.0277

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 104-10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
March 27, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
125	100	40.0	1.95	5.8	-34.2	.0195
150	100	40.0	1.10	1.0	-39.0	.0110
200	159	44.0	1.00	0.0	-44.0	.00629
250	239	47.5	1.00	0.0	-47.5	.00418
300	325	50.4	1.00	0.0	-50.4	.00308
350	390	51.9	1.00	0.0	-51.9	.00256
400	405	52.3	.800	-1.9	-54.2	.00198
450	316	50.0	.600	-4.4	-54.4	.00190
500	215	46.6	.450	-6.9	-53.5	.00209
600	185	45.4	.400	-7.9	-53.3	.00216
700	195	45.9	.500	-6.1	-52.0	.00256
735	355	51.0	.900	-0.9	-51.9	.00254
745	340	50.7	1.00	0.0	-50.7	.00294
800	360	51.2	.520	-5.8	-57.0	.00145
870	448	53.1	.287	-10.8	-63.9	.000643
1150	440	52.9	.303	-10.3	-63.2	.000690
1200	520	54.3	.290	-10.7	-65.0	.000560
1300	595	55.5	.600	-3.6	-59.1	.00111
1400	665	56.5	.635	-3.9	-60.4	.000955
1500	762	57.7	.935	-0.5	-58.2	.00123
1630	986	59.9	1.00	0.0	-59.9	.00101
1750	664	56.5	1.00	0.0	-56.5	.00151
1800	212	46.6	1.00	0.0	-46.6	.00471
1850	1840	65.3	1.00	0.0	-65.3	.000544
1900	1770	64.9	1.00	0.0	-64.9	.000565
1950	1920	65.8	1.00	0.0	-65.8	.000522
2000	2300	67.3	1.00	0.0	-67.3	.000435
2100	2990	69.6	1.00	0.0	-69.6	.000335
2200	1920	65.7	.660	-3.6	-69.3	.000343
2300	1290	62.3	.660	-3.6	-69.3	.000511
2500	880	58.8	.490	-6.2	-68.5	.000557
3000	522	54.4	NL			
3500	338	50.6	NL			
3900	1000	60.0	NL			
4300	1180	61.6	.316	-10.0	-71.6	.000268
4500	446	53.1	NL			
5000	140	43.0	NL			
5500	84.0	38.5	NL			
6100	566	55.0	.340	-9.3	-64.3	.000600

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 104-10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
March 27, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
6700	740	57.4	.900	-0.9	-58.3	.00122
6840	740	57.4	.960	-0.3	-57.7	.00130
7000	710	57.0	NL			
7500	473	53.5	NL			
8000	365	51.3	NL			
8500	43.5	32.8	NL			
9000	5.00	14.0	NL			
9400	24.8	27.8	2.06	6.3	21.5	.0830
10,000	106	40.6	1.44	3.2	37.4	.0136

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
2	12.5
4	25.0
6	37.5
8	50.0
10	62.7
12	75.5
14	89.5
15	96.2

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

6.0 thousandths of an inch
4.9 after ½ minute
4.7 after 1 minute
4.2 after 2 minutes

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 104-10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
March 27, 1950

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -16 db and -18 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

005L

Lord 102 PH 6 Isolator
Rated Load 6 lbs.
Test Load 2.1 lbs.
March 22, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmissibility
2	13.6	11.9	-1.2	.875
4	10.2	8.5	-1.7	.833

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
12	1.00	0.0	1.54	3.7	3.7	1.54
14	1.00	0.0	1.73	4.7	4.7	1.73
16	1.00	0.0	1.98	5.9	5.9	1.98
18	1.00	0.0	2.48	7.9	7.9	2.48
20	1.00	0.0	3.28	10.4	10.4	3.28
21	1.00	0.0	4.28	12.7	12.7	4.28
22	1.00	0.0	6.05	15.7	15.7	6.05
23	1.00	0.0	9.70	19.8	19.8	9.70
24	.500	-6.1	10.0	20.0	26.1	20.0
24.2	.400	-7.9	9.75	19.8	27.7	24.4
25	.500	-6.1	8.30	18.4	24.5	16.6
26	1.00	0.0	8.10	18.2	18.2	8.1
27	1.00	0.0	4.95	13.8	13.8	4.95
28	1.00	0.0	3.65	11.3	11.3	3.65
29	1.00	0.0	2.81	9.0	9.0	2.81
30	1.00	0.0	2.25	7.1	7.1	2.25
31	1.00	0.0	1.92	5.7	5.7	1.92
32	1.00	0.0	1.65	4.3	4.3	1.65
33	1.00	0.0	1.42	3.1	3.1	1.42
34	1.00	0.0	1.27	2.2	2.2	1.27
35	1.00	0.0	1.11	1.0	1.0	1.11
36	2.00	6.0	2.00	6.0	0.0	1.00
37	2.00	6.0	1.79	5.0	-1.0	.895
38	2.00	6.0	1.62	4.2	-1.8	.810
39	2.00	6.0	1.48	3.4	-2.6	.740
40	2.00	6.0	1.37	2.8	-3.2	.685
41	2.00	6.0	1.27	2.2	-3.8	.635
43	2.00	6.0	1.11	1.0	-5.0	.555
45	3.00	9.6	1.42	3.1	-6.5	.473
50	3.00	9.6	1.10	0.9	-8.7	.367
60	5.00	13.9	1.10	0.9	-13.0	.220

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 102 PH 6 Isolator
Rated Load 6 lbs.
Test Load 2.1 lbs.
March 22, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
70	7	15.9	1.03	0.3	-15.6	.147
80	10	20.0	1.37	2.7	-17.3	.137
90	20	26.0	1.84	5.3	-20.7	.0920
100	20	26.0	1.50	3.5	-22.5	.0730
120	25	28.0	1.28	2.2	-25.8	.0512
150	50	33.9	1.17	1.5	-32.4	.0234
200	100	40.0	1.82	5.2	-34.8	.0182
250	100	40.0	1.14	1.3	-38.7	.0114
300	200	46.0	1.66	4.3	-41.7	.00830
350	200	46.0	1.27	2.1	-43.9	.00635
400	250	48.0	1.13	1.2	-46.8	.00452
450	250	48.0	1.03	0.3	-47.7	.00412
500	350	50.9	1.06	0.6	-50.3	.00303
600	404	52.2	1.0	0.0	-52.2	.00248
700	340	50.7	.62	-4.1	-54.8	.00182
740	327	50.3	.520	-5.7	-56.0	.00159
800	286	49.1	.505	-6.0	-55.1	.00176
826	281	49.0	1.00	0.0	-49.0	.00361
850	375	51.5	.500	-6.1	-57.6	.00133
870	346	50.8	.670	-3.4	-54.2	.00194
900	100	40.0	1.52	3.8	-36.2	.0152
920	350	50.9	.680	-3.3	-54.2	.00194
950	316	50.0	.505	-6.0	-56.0	.00159
1120	300	49.6	.500	-6.1	-54.7	.00167
1290	372	51.4	.64	-3.8	-55.2	.00172
1360	414	52.4	.375	-8.5	-60.9	.000906
1450	572	55.1	1.00	0.0	-55.1	.00175
1590	640	56.2	2.00	6.0	-50.2	.00312
1700	800	58.2	1.11	1.0	-57.2	.00139
1800	1000	60.0	1.44	3.2	-56.8	.00144
1900	2000	66.0	2.93	9.4	-56.6	.00146
1950	6800	76.7	13.0	22.7	-54.0	.00191
1970	820	58.3	2.00	6.0	-52.3	.00244
2030	6200	75.9	24.0	27.6	-48.3	.00387
2100	3000	69.6	13.2	22.5	-47.1	.00440
2200	1000	60.0	4.25	12.7	-47.3	.00425
2300	1000	60.0	4.52	13.2	-46.8	.00452
2400	1000	60.0	3.75	11.7	-48.3	.00375

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 102 PH 6 Isolator
Rated Load 6 lbs.
Test Load 2.1 lbs.
March 22, 1950

Frequency cps***	Accelerometer Readings — Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
2500	500	53.9	2.12	6.6	-47.3	.00424
2600	400	52.1	3.10	9.9	-42.2	.00775
2700	300	49.6	1.58	3.9	-45.7	.00527
2800	500	53.9	1.41	3.0	-50.9	.00282
2900	510	54.1	.640	-3.8	-57.9	.00125
3000	515	54.2	.550	-5.3	-59.5	.00107
3230	518	64.2	1.00	0.0	-64.2	.00195
3270	500	53.9	1.32	2.5	-51.4	.00264
3430	450	53.1	4.14	12.5	-40.6	.00920
4040	1000	60.0	5.00	-13.9	-46.1	.00500
4400	500	53.9	1.71	4.7	-49.2	.00342
6200	422	52.7	.500	-6.1	-58.8	.00118
6730	710	57.0	.290	-10.7	-67.7	.000409
8000	630	56.1	.565	-5.0	-61.1	.000897
10,800	100	40.0	1.20	1.70	-38.3	.0120

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
1	8.9
2	18.2
3	26.7
4	34.9
5	44.1
6	53.1
7	62.9
8	72.0
9	81.2
10	91.2

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-on4-32904

Lord 102 PH 6 Isolator
Rated Load 6 lbs.
Test Load 2.1 lbs.
March 22, 1950

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

3.5 thousandths of an inch
2.8 after ½ minute
2.5 after 1 minute
2.3 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -21 db and -18 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 150 PH10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
April 4, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	13.1	12.1	-0.7	0.920
4	10.5	11.1	-0.6	1.06
6	8.3	10.4	2.0	1.25
7	7.1	9.1	2.2	1.28
8	6.6	10.2	3.8	1.55
9	5.6	9.4	4.6	1.68
10	4.5	10.4	7.3	2.31

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
10.5	1.00	0.0	5.60	14.9	14.9	5.60
10.75	1.00	0.0	6.30	16.0	16.0	6.30
11	1.00	0.0	7.40	17.4	17.4	7.40
12	1.00	0.0	16.5	24.4	24.4	16.50
12.5	1.00	0.0	27.5	28.9	28.9	27.5
13	1.00	0.0	12.5	22.0	22.0	12.50
14	1.00	0.0	2.50	14.4	14.4	5.20
15	1.00	0.0	3.00	9.8	9.8	3.00
16	1.00	0.0	2.15	6.6	6.6	2.15
17	1.00	0.0	1.65	4.4	4.4	1.65
18	1.00	0.0	1.25	2.0	2.0	1.25
19	1.00	0.0	1.00	0.0	0.0	1.00
20	2.00	6.0	1.68	4.5	-1.5	.840
21	2.00	6.0	1.45	3.3	-2.7	.725
22	10.00	20.0	6.30	16.0	-4.0	.630
23	10.0	20.0	5.75	15.1	-4.9	.575
24	10.0	20.0	5.00	14.0	-6.0	.500
25	10.0	20.0	4.50	13.1	-6.9	.450
30	10.0	20.0	2.90	9.4	-10.6	.290
35	10.0	20.0	1.89	5.5	-14.5	.189
40	10.0	20.0	1.35	3.6	-17.4	.135
45	10.0	20.0	1.00	0.0	-20.0	.100
50	100.	40.0	8.90	19.0	-21.0	.0890
60	100.	40.0	6.00	15.6	-24.4	.0600
70	100.	40.0	4.35	12.8	-27.2	.0435
80	100.	40.0	3.45	10.8	-29.2	.0345
90	100.	40.0	2.55	8.3	-31.7	.0255
100	100.	40.0	2.05	6.3	-33.7	.0205

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 150 PH10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
April 4, 1950

Frequency cps***	Accelerometer Readings				db change	Transmissibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
125	100.	40.0	1.45	3.3	-36.7	.0145
150	200.	46.0	1.85	5.4	-40.6	.00925
200	500.	53.9	2.35	7.4	-46.5	.00470
250	500.	53.9	1.51	3.6	-50.3	.00302
300	500.	53.9	1.00	0.0	-53.9	.00200
350	500.	53.9	.830	-1.6	-55.5	.00166
380	313.	49.9	.375	-8.5	-58.4	.00120
390	281.	49.0	.303	-10.4	-59.4	.00108
400	316.	50.0	.700	-3.1	-53.1	.00222
420	244.	47.8	.400	-7.9	-55.7	.00164
485	235.	47.5	.395	[illegible].0	-55.5	.00168
500	235.	47.5	.840	-1.5	-49.0	.00358
630	1100.	61.0	.560	-5.1	-66.1	.000509
1250	490.	53.8	.490	-6.3	-60.1	.000100
1460	540.	54.6	.820	-1.6	-56.2	.00152
1550	680.	56.6	.920	-0.6	-57.2	.00135
1950	5400.	74.6	3.10	9.9	-64.7	.000574
2300	720.	57.2	.900	-0.9	-58.1	.00125
3250	340.	50.8	.390	-8.1	-58.9	.00115
3950	870.	58.8	1.00	0.0	-58.8	.00115
4300	1790.	65.0	.900	-0.9	-65.9	.000502
6000	340.	50.6	.800	-1.9	-52.5	.00236
7000	1600.	64.1	.900	-0.9	-65.0	.000563
7150	2090.	66.4	1.35	2.6	-63.8	.000645
9000	7.50	17.6	.470	-6.6	-24.2	.0627

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -20 db and -22 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 150 PH10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
April 4, 1950

Static Test Data

Load in pounds.	Deflection in thousandths of an inch.
0	0.0
2	10.0
4	21.0
6	32.5
8	45.0
10	58.3
12	72.0
14	85.5
15	93.5

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

3.0 thousandths of an inch
1.7 after ½ minute
0.9 after 1 minute
0.8 after 2 minutes

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 153 PH 10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
April 3, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	13.2	12.3	-0.6	.932
4	11.7	11.8	0.1	1.01
6	8.2	11.9	3.2	1.45
7	7.2	10.7	3.5	1.49
8	6.3	11.6	5.2	1.84

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
9	1.00	0.0	4.75	13.5	13.5	4.75
10	1.00	0.0	9.30	19.5	19.5	9.30
10.25	1.00	0.0	13.5	22.6	22.6	13.5
10.5	1.00	0.0	18.5	25.4	25.4	18.5
10.75	1.00	0.0	17.9	25.0	25.0	17.9
11	1.00	0.0	15.5	23.8	23.8	15.5
11.5	1.00	0.0	9.50	19.6	19.6	9.50
12	1.00	0.0	5.90	15.4	15.4	5.90
12.5	1.00	0.0	4.20	12.6	12.6	4.20
13	1.00	0.0	3.10	9.9	9.9	3.10
14	1.00	0.0	2.00	6.0	6.0	2.00
15	1.00	0.0	1.50	3.5	3.5	1.50
16	1.00	0.0	1.11	1.0	1.0	1.11
17	2.00	6.0	1.75	4.8	-1.2	.875
18	2.00	6.0	1.45	3.4	-2.6	.725
19	2.00	6.0	1.20	1.6	-4.4	.600
20	2.00	6.0	1.00	0.0	-6.0	.500
25	7.60	17.6	2.00	6.0	-11.6	.264
30	5.00	13.9	1.11	1.0	-12.9	.222
35	10.0	20.0	1.50	3.5	-16.5	.150
40	10.0	20.0	1.00	0.0	-20.0	.100
45	20.0	26.0	1.55	3.8	-22.2	.0775
50	20.0	26.0	1.25	2.0	-24.0	.0625
60	100.	40.0	4.50	13.1	-26.9	.0450
70	100	40.0	3.30	10.4	-29.6	.0330
80	100	40.0	2.60	8.4	-31.6	.0260
90	100	40.0	1.91	5.7	-34.3	.0191
100	100	40.0	1.59	4.0	-36.0	.0159

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 153 PH 10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
April 3, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
125	200	46.0	1.83	5.2	-40.8	.0092
150	200	46.0	1.37	2.8	-43.2	.00685
175	200	46.0	1.00	0.0	-46.0	.00500
200	300	49.6	1.18	1.6	-48.0	.00393
250	500	53.9	1.22	1.9	-52.0	.00244
300	450	53.1	.890	-1.0	-54.1	.00198
350	337	50.6	.590	-4.6	-55.2	.00175
380	390	51.8	.750	-2.5	-54.3	.00192
390	400	52.1	.345	-9.2	-61.3	.000865
400	390	51.8	.275	-11.2	-63.0	.000705
450	368	51.3	.295	-10.5	-61.8	.000804
500	288	49.2	.758	-2.4	-51.6	.00267
590	282	49.0	1.00	0.0	-49.0	.00355
670	3320	70.5	3.00	9.6	-60.9	.000904
895	233	47.3	.150	-16.5	-63.8	.000644
1425	280	49.0	.280	-11.0	-60.0	.00100
1480	200	46.0	3.30	10.4	-35.6	.0165
1550	240	47.6	.310	-10.1	-57.7	.00129
1825	1000	60.0	1.61	24.2	-35.8	.00161
1900	1650	64.4	.390	-8.1	-72.5	.000236
2000	3350	70.5	3.16	10.0	-60.5	.000944
2250	310	49.9	.150	-16.5	-66.4	.000484
2400	740	57.4	1.09	0.9	-56.5	.00147
3000	350	50.9	.330	-9.6	-60.5	.000944
4250	1170	61.5	.350	-9.1	-70.6	.000816
5000	330	50.4	.316	-10.0	-60.4	.000958
5600	170	44.6	.380	-8.4	-53.0	.00224
6300	1240	62.0	.640	-3.8	-65.8	.000516
7500	1200	61.6	.840	-1.5	-63.1	.000700
8900	23.4	27.4	.600	-4.4	-31.8	.0256
9200	8.6	18.6	3.35	10.5	-8.1	.390
9550	16.5	24.4	2.50	8.0	-16.4	.151
10,600	330	50.5	.720	-2.8	-53.3	.00218
10,900	93.0	39.5	2.00	6.0	-33.5	.0215

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 153 PH 10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
April 3, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
2	13.9
4	28.1
6	44.0
8	60.8
10	78.2
12	98.0
14	120.0
15	130.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

3.5 thousandths of an inch
2.2 after $\frac{1}{2}$ minute
1.5 after 1 minute
1.4 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively, -24 db and -21 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 102 PH 10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
March 22, 1950

Frequency cps***	Accelerometer Readings				db change	Transmissibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
7	1.00	0.0	2.00	6.0	6.0	2.00
8	1.00	0.0	2.30	7.2	7.2	2.30
9	1.00	0.0	2.77	8.8	8.8	2.77
10	1.00	0.0	3.20	10.2	10.2	3.20
11	1.00	0.0	4.40	12.9	12.9	4.40
12	1.00	0.0	8.40	18.5	18.5	8.40
12.5	1.00	0.0	16.9	24.2	24.2	16.9
13	Resonance-Readings unobtainable					
14	.810	-1.8	6.90	16.8	18.6	8.53
15	1.00	0.0	4.50	13.1	13.1	4.50
16	1.00	0.0	2.83	9.1	9.1	2.83
17	1.00	0.0	2.08	6.3	6.3	2.08
18	1.00	0.0	1.59	4.0	4.0	1.59
19	1.00	0.0	1.27	2.2	2.2	1.27
20	2.00	6.0	2.08	6.3	0.3	1.04
21	2.00	6.0	1.77	4.8	-1.2	.885
22	2.00	6.0	1.50	3.5	-2.5	.750
23	2.00	6.0	1.31	2.4	-3.6	.655
24	2.00	6.0	1.17	1.4	-4.6	.585
25	2.00	6.0	1.01	0.1	-5.9	.505
30	4.00	12.1	1.27	2.2	-9.9	.318
35	5.00	13.9	1.11	1.0	-12.9	.220
40	10.0	20.0	1.73	4.7	-15.3	.173
45	10.0	20.0	1.18	1.6	-18.4	.118
50	100	40.0	9.75	19.8	-20.2	.0975
60	30.0	29.6	1.90	5.6	-24.0	.0633
70	500	53.9	24.5	27.8	-26.1	.0490
80	500	53.9	18.6	25.3	-28.6	.0372
90	500	53.9	14.2	23.1	-30.8	.0284
100	500	53.9	11.5	21.3	-32.6	.0230
125	500	53.9	9.20	19.3	-34.6	.0184
150	500	53.9	5.60	14.9	-39.0	.0112
175	500	53.9	4.05	12.2	-41.7	.00810
200	500	53.9	3.07	9.8	-44.1	.00614
230	500	53.9	2.27	7.2	-46.7	.00454

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 102 PH 10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
March 22, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
300	500	53.9	1.34	2.7	-51.2	.00268
350	443	53.0	.940	-0.4	-57.0	.00212
400	462	53.2	.780	-2.1	-55.3	.00169
450	465	53.3	.610	-4.3	-57.6	.00131
500	322	50.3	.490	-6.2	-56.5	.00152
523	310	49.9	.575	-4.8	-54.7	.00185
594	366	51.3	.340	-9.3	-60.6	.000929
1220	500	53.9	.333	-9.5	-63.4	.000666
1400	410	52.2	.610	-4.3	-56.5	.00149
1500	700	56.9	.333	-9.5	-66.4	.000476
1700	1320	62.5	1.27	2.2	-60.3	.000963
1750	1240	62.0	1.20	1.7	-60.3	.000968
1850	2500	68.0	5.15	14.2	-43.8	.00206
1900	4000	72.1	5.45	14.7	-57.4	.00136
1950	7000	76.9	6.90	15.8	-61.1	.000986
2000	6220	76.0	5.40	14.7	-61.3	.000868
2100	2820	69.0	1.91	5.7	-63.3	.000677
2200	1690	64.4	1.50	3.5	-60.9	.000888
2300	1190	61.6	1.30	2.4	-59.2	.00109
2500	840	58.5	.690	-3.2	-61.7	.000822
2720	530	54.5	.410	-7.6	-62.1	.000774
6040	1310	62.4	.420	-7.4	-69.8	.000321
6780	860	58.7	.300	-10.3	-69.0	.000349

Static Test Data

Load in pounds	Deflection in thousandths of an inch
1	6.7
2	11.9
3	16.8
4	21.9
5	27.1
6	32.1
7	37.7
8	42.8

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 102 PH 10 Isolator
Rated Load 10 lbs.
Test Load 9.89 lbs.
March 22, 1950

Load in pounds	Deflection in thousandths of an inch
9	48.0
10	53.5
11	59.1
12	64.5
13	70.1
14	75.1
15	81.4

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

3.8 thousandths of an inch
3.5 after ½ minute
3.3 after 1 minute
3.2 after 2 minutes.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -16 db and -16 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

009B

Barry 104-20 Isolator
Rated Load 10-26 lbs.
Test Load 20.36 lbs.
November 21, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	23.0	22.2	-0.3	.965
3	26.0	25.2	-0.2	.970
4	30.0	31.0	0.3	1.04
5	24.3	25.2	0.3	1.04
6	19.2	20.7	0.7	1.08
7	20.3	23.8	1.3	1.17
8	18.4	22.8	1.9	1.24
9	17.0	21.0	1.9	1.24
10	16.8	21.5	2.1	1.28
11	10.6	17.2	4.2	1.62
12	7.7	15.0	5.9	1.95
13	4.6	13.9	9.7	3.02

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
14	1.20	2.2	4.70	13.5	11.3	3.92
15	1.00	0.0	7.20	17.0	17.0	7.20
16	1.10	1.1	11.0	21.0	19.9	10.0
16.5	.850	-1.5	6.80	16.6	18.1	8.00
17	1.10	1.0	7.60	17.6	16.6	6.90
18	2.29	7.2	8.20	18.3	11.1	3.58
19	3.30	10.4	7.80	18.0	7.6	2.36
20	4.30	12.4	8.00	18.1	5.7	1.86
22	10.5	20.5	11.3	21.2	0.7	1.08
25	12.6	22.2	9.40	19.5	-2.7	.745
30	15.0	23.5	6.5	16.4	-7.1	.433
35	30.5	29.8	9.00	19.1	-10.7	.295
40	81.5	38.2	14.9	23.4	-14.8	.183
45	32.1	30.2	4.85	13.7	-16.5	.151
50	34.7	30.8	4.20	12.6	-18.2	.121
55	38.0	31.6	3.82	11.6	-20.0	.100
60	49.0	33.8	4.35	12.6	-21.0	.0890
65	25.2	28.1	1.81	5.1	-23.0	.0720
70	18.8	25.5	1.10	1.0	-24.4	.0585
80	94.0	39.5	4.51	13.2	-26.3	.0480
90	160	44.1	5.85	15.4	-28.7	.0366
100	210	46.3	6.00	15.6	-30.7	.0285
150	430	52.8	5.70	15.1	-37.7	.0132

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

009B

Barry 104-20 Isolator
Rated Load 10-26 lbs.
Test Load 20.36 lbs.
November 21, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
200	413	52.4	3.08	9.8	-42.6	.00745
250	280	49.0	1.38	2.8	-46.2	.00494
300	267	48.5	.970	-.2	-48.7	.00363
350	318	50.1	.840	-1.5	-51.6	.00264
500	211	46.5	.320	-9.8	-56.3	.00145
600	238	47.5	.316	-10.0	-57.5	.00133
700	288	49.2	.372	-8.6	-57.8	.00129
800	371	51.4	.460	-6.8	-57.3	.00124
1150	360	51.1	.842	-1.5	-52.6	.00234
1625	280	49.0	.390	-8.1	-57.1	.00139
1825	480	53.6	.270	-11.3	-64.9	.000563
2750	1720	64.8	.480	-6.5	-71.2	.000279
3000	1390	62.4	.535	-4.9	-67.7	.000385

Upper crystal in noise level for all frequencies above 3000 c.p.s.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -27 db and -27 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

009B

Barry 104-20 Isolator
Rated Load 10-26 lbs.
Test Load 20.36 lbs.
November 21, 1949

Static Test Data

Load in pounds.	Deflection in thousandths of an inch.
1	3.5
2	6.7
4	11.2
6	16.4
8	22.1
10	27.5
12	33.5
14	39.6
16	45.4
18	50.6
20	56.0
22	61.5
23.62	66.7
25.62	72.4
27.62	78.4

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

14.0 thousandths of an inch
11.0 after ½ minute
10.0 after 1 minute
8.5 after 2 minutes

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 156 PH 9 Isolator
Rated Load 9 lbs.
Test Load 9.89 lbs.
March 30, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	11.1	11.3	0.2	1.02
4	9.8	9.5	-0.2	.97
5	7.8	11.7	3.5	1.50
6	6.1	12.4	6.2	2.03
7	3.1	11.6	11.5	3.74
7.2	3.2	14.5	13.2	4.53
7.4	3.5	24.7	17.0	7.06
7.6	2.7	20.9	17.9	7.74
8	1.9	14.7	17.9	7.74
8.2	1.7	10.9	16.1	6.41
8.4	1.8	13.3	17.5	7.39
9	3.5	11.1	10.0	3.17
10	6.5	10.1	3.8	1.55

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
11	1.00	0.0	1.06	0.6	0.6	1.06
13	19.0	25.6	10.0	20.0	-5.6	.526
14	21.0	26.4	10.0	20.0	-6.4	.476
15	26.5	28.5	10.0	20.0	-8.5	.377
16	32.0	30.1	10.0	20.0	-10.1	.313
17	37.0	31.4	10.0	20.0	-11.4	.270
18	43.0	32.7	10.0	20.0	-12.7	.233
19	50.0	33.9	10.0	20.0	-13.9	.200
20	57.0	35.1	10.0	20.0	-15.1	.176
22	74.0	37.4	10.0	20.0	-17.4	.136
25	96.0	39.7	10.0	20.0	-19.7	.105
30	135	42.7	10.0	20.0	-22.7	.0741
35	179	45.0	10.0	20.0	-25.0	.0560
40	245	47.8	10.0	20.0	-27.8	.0409
45	300	49.6	10.0	20.0	-29.6	.0333
50	385	51.7	10.0	20.0	-31.7	.0261
60	550	54.8	10.0	20.0	-34.8	.0180
70	720	57.2	10.0	20.0	-37.2	.0139
80	100	40.0	1.00	0.0	-40.0	.0100
90	111	41.0	1.00	0.0	-41.0	.00910

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 156 PH 9 Isolator
Rated Load 9 lbs.
Test Load 9.89 lbs.
March 30, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	Driver db	Weight Millivolts	Weight db	db change	Transmissibility
100	141	43.0	1.00	0.0	-43.0	.00710
120	220	46.9	1.00	0.0	-46.9	.00455
140	270	48.6	1.00	0.0	-48.6	.00370
150	316	50.0	1.00	0.0	-50.0	.00317
175	430	52.7	1.00	0.0	-52.7	.00233
200	540	54.6	1.00	0.0	-54.6	.00185
250	520	54.3	.740	-2.5	-56.8	.00142
300	480	53.6	.450	-6.9	-60.5	.000940
350	430	52.7	.350	-9.1	-61.8	.000796
400	450	53.1	.250	-12.0	-65.1	.000556
450	405	52.3	.200	-14.0	-66.3	.000495
480	291	49.4	.320	-9.9	-59.3	.00110
500	211	46.5	.420	-7.4	-53.9	.00504
502	250	48.0	.860	-1.3	-49.3	.00344
518	330	50.5	.500	-6.1	-56.6	.00152
590	241	47.7	.270	-11.0	-58.7	.00112
620	600	55.6	.460	-6.7	-62.3	.000766
640	1060	60.6	1.00	0.0	-60.6	.000944
660	2560	68.2	1.00	0.0	-68.2	.000391
1040	350	51.0	.270	-11.4	-62.4	.000770
1400	700	56.9	.400	-7.9	-64.8	.000571
1425	580	55.4	.500	-6.1	-61.5	.000861
1440	478	53.6	.790	-2.0	-55.6	.00165
1500	600	55.6	1.00	0.0	-55.6	.00167
1570	660	56.4	2.00	6.0	-50.4	.00333
1720	1420	63.1	.720	-2.8	-65.9	.000517
1870	2000	66.0	8.90	19.0	-47.0	.00445
1900	3000	69.6	3.65	11.3	-58.3	.00122
1950	10000	80.0	8.30	18.4	-61.6	.000830
2000	5150	74.1	2.00	6.0	-68.1	.000388
2100	2310	67.3	.750	-2.5	-69.8	.000323
2280	958	59.7	.444	-7.0	-66.7	.000460
2430	673	56.6	.490	-6.2	-62.8	.000730
3310	400	52.1	.250	-12.0	-64.1	.000625
3830	690	56.8	.230	-12.8	-69.6	.000334
4400	1200	61.6	.580	-4.7	-66.5	.000483
4520	878	58.8	.355	-9.0	-67.8	.000405
4750	660	56.4	.200	-14.0	-70.4	.000303
5190	189	45.5	.265	-11.5	-57.0	.00140

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 156 PH 9 Isolator
Rated Load 9 lbs.
Test Load 9.89 lbs.
March 30, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
6320	868	58.8	.425	-7.3	-66.1	.000490
6450	105	40.5	.533	-5.5	-46.0	.00506
6680	184	45.3	.187	-14.6	-59.9	.00102
7140	750	57.5	.64	-3.8	-61.3	.000856
7360	875	58.8	.600	-4.4	-63.2	.000685
7440	1170	61.5	.474	-6.5	-68.0	.000404
8770	83.0	38.4	.390	-8.1	-46.5	.00470
8940	17.8	24.9	1.24	2.0	-22.9	.0697
9080	11.8	21.6	2.78	8.8	-12.8	.235
9200	11.1	21.0	2.78	8.8	-12.2	.250
9300	17.1	24.6	2.15	6.7	-17.9	.126
9340	19.2	25.7	2.60	8.3	-17.4	.135
9740	42.5	32.7	.750	-2.5	-35.2	.0177
9800	71.0	37.0	.280	-11.1	-48.1	.00395
9900	100	40.0	.595	-4.5	-45.5	.00595
10,000	100	40.0	1.83	4.7	-35.3	.0183
10,500	433	52.8	1.18	1.5	-51.3	.00367
10,700	205	46.3	2.18	6.7	-39.6	.0106
10,900	100	40.0	1.21	1.8	-38.2	.0121
12,100	49.0	33.8	.640	-3.8	-37.6	.0131
13,900	47.5	33.6	.750	-2.5	-36.1	.0158
14,500	12.5	22.0	1.06	0.6	-21.4	.0848
15,000	30.0	29.6	.400	-7.9	-37.5	.0133
16,100	111	41.0	.180	-14.9	-55.9	.00162
16,300	10.7	20.7	.200	-14.0	-34.7	.0187
16,500	66.5	36.5	.160	-16.0	-52.5	.00240
18,200	66.0	36.4	.265	-11.5	-47.9	.00402
18,800	106	40.6	.750	-2.5	-43.1	.00707

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 156 PH 9 Isolator
Rated Load 9 lbs.
Test Load 9.89 lbs.
March 30, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
2	48.0
4	91.7
6	132.2
8	172.0
10	204.0
12	241.2
14	276.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

7.0 thousandths of an inch
3.5 after ½ minute
2.0 after 1 minute
1.8 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other [illegible]s to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -18 db and -21 db.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

032M

MB 1732.6 Isolator
Rated Load 16-26 lbs.
Test Load 20.36 lbs.
November 1, 1949

Frequency cps*	Displacements,** of Driver	Weight	Equivalent db change	Transmis-sibility
2	60.5	61.0	0.1	1.01
3	58.5	60.0	0.3	1.03
4	55.5	59.5	0.7	1.07
5	54.0	59.0	0.9	1.10
6	43.0	55.0	2.2	1.28
7	28.0	36.5	2.4	1.30
8	29.0	45.0	3.8	1.55
9	24.0	39.0	4.2	1.62

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
10	10.0	20.0	18.5	25.3	5.3	1.85
10.5	10.0	20.0	22.6	27.1	7.1	2.26
11	10.0	20.0	29.2	29.3	9.3	2.93
12	10.0	20.0	51.5	34.2	14.2	5.15
13	10.0	20.0	53.0	34.5	14.5	5.30
13.5	10.0	20.0	52.0	34.4	14.4	5.20
14	4.45	13.0	30.0	29.7	16.7	6.75
14.5	10.0	20.0	44.0	32.9	12.9	4.40
15	10.0	20.0	35.5	31.1	11.1	3.55
16	10.0	20.0	24.1	27.7	7.7	2.41
17	10.0	20.0	18.1	25.2	5.2	1.81
18.5	10.0	20.0	12.0	21.8	1.8	1.20
20	10.0	20.0	9.55	19.7	-0.3	.955
25	10.0	20.0	4.92	13.8	-6.2	.492
30	10.0	20.0	3.00	9.6	-10.4	.300
35	10.0	20.0	2.08	6.4	-13.6	.208
40	6.20	15.9	1.00	0.0	-15.9	.161
50	32.0	20.0	1.00	0.0	-20.0	.100
60	32.0	30.3	2.00	6.0	-24.3	.0625
70	27.0	28.5	1.4	2.8	-25.7	.0520
80	28.0	29.0	1.00	0.0	-29.0	.0357
90	18.0	25.0	.500	-6.0	-31.0	.0278
100	16.0	24.0	.360	-8.7	-32.7	.0225
130	48.0	33.5	.610	-4.5	-38.0	.0127

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1732.6 Isolator
Rated Load 16-26 lbs.
Test Load 20.36 lbs.
November 1, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weights Millivolts	db	db change	Transmissibility
160	42.0	32.5	.360	-8.7	-41.2	.00860
190	19.0	25.5	.125	-18.0	-43.5	.00660
200	20.5	26.3	.125	-18.0	-44.3	.00610
250	69.5	36.8	.250	-12.0	-48.8	.00360
300	59.0	35.3	.150	-16.5	-51.8	.00254
350	56.0	35.0	.100	-20.0	-55.0	.00179
400	230	47.2	.300	-10.5	-57.7	.00130
500	235	47.5	.200	-14.0	-61.5	.000855
600	250	48.0	.190	-14.5	-62.5	.000760
700	330	50.5	.270	-11.7	-62.2	.000820
800	820	58.5	.490	-6.3	-64.8	.000600
900	1900	65.5	1.40	2.5	-63.0	.000760
1000	130	42.5	.190	-14.5	-57.0	.00146
1850	160	44.0	.210	-13.5	-57.3	.00131
3100	520	54.0	.240	-12.5	-66.5	.000460
4150	150	43.5	.230	-13.6	-57.1	.00153
5100	270	48.6	.160	-16.0	-64.6	.000593
6800	220	47.0	.180	-15.0	-62.0	.000819
8800	140	43.0	.740	-3.0	-46.0	.00528
9100	100	40.0	.316	-10.0	-50.0	.00316

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	17.0
10	35.0
15	51.9
20	68.0
25	86.0
30	103.2
40	138.0

Test Data (cont'd) 032M
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1732.6 Isolator
Rated Load 16-26 lbs.
Test Load 20.36 lbs.
November 1, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

1.5 thousandths of an inch
0.8 after ½ minute
0.5 after 1 minute
0.0 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -24 db and -24 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 206 PH 20
Rated Load 20 lbs.
Test Load 20.36 lbs.
November 17, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	24.0	23.5	-0.1	0.98
3	28.6	30.0	0.5	1.05
4	23.4	27.5	1.3	1.18
5	18.5	24.0	2.2	1.30
6	21.5	34.6	4.1	1.61
7	11.2	24.6	6.9	2.20
8	5.7	23.7	12.2	4.16
8.5	2.5	18.0	17.1	7.20
8.8	2.0	16.5	18.3	8.25
9	1.5	15.5	20.3	10.32

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
9.2	1.00	0.0	5.60	14.9	14.9	5.60
9.5	1.00	0.0	4.65	13.4	13.4	4.65
10.0	1.00	0.0	3.27	10.4	10.4	3.27
11	1.00	0.0	2.02	6.1	6.1	2.02
12	2.00	6.0	2.72	8.7	2.7	1.36
13	3.05	9.7	3.00	9.6	-0.1	.983
14	4.30	12.7	3.20	10.2	-2.5	.744
15	3.70	11.4	2.20	6.9	-4.5	.595
16	1.93	5.7	1.11	1.0	-4.7	.575
17	3.50	10.9	1.63	4.2	-6.7	.466
18	5.15	14.2	1.92	5.7	-8.5	.373
20	6.15	15.8	1.67	4.4	-11.4	.272
25	13.6	22.7	2.11	6.6	-16.1	.155
30	29.0	29.3	3.00	9.6	-19.7	.1035
40	47.8	33.6	2.78	8.9	-24.7	.0582
50	60.0	35.6	2.20	6.8	-28.8	.0367
60	80.0	38.1	2.10	6.4	-31.7	.0263
75	130.0	42.5	2.24	7.0	-35.5	.0172
100	193.0	45.8	1.88	5.5	-40.3	.00974
125	357.0	51.1	2.17	6.7	-44.4	.00607
150	400.0	52.1	1.65	4.3	-47.8	.00412
190	308.0	49.8	.800	-1.8	-51.6	.00260
300	232.0	47.4	.246	-12.1	-59.5	.00102
510	340.0	50.7	.280	-11.0	-61.7	.000824

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 206 PH 20
Rated Load 20 lbs.
Test Load 20.36 lbs.
November 17, 1949

Frequency cps***	Accelerometer Readings				db change	Transmissibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
910	97.0	39.8	.225	-13.0	-52.8	.00232
1640	67.0	36.5	.335	-9.4	-45.9	.00500
2590	510.0	54.0	.500	-6.0	-60.0	.000980

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
1	7.3
2	15.4
4	33.0
6	52.3
8	71.6
10	90.5
12	107.6
14	131.7
16	149.5
18	169.0
20	190.6
22	209.6
23	220.1
26	247.8
28	267.8
30	284.0

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd) 033L
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 206 PH 20
Rated Load 20 lbs.
Test Load 20.36 lbs.
November 17, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

7.2 thousandths of an inch
4.2 after ½ minute
2.7 after 1 minute
2.1 after 1½ minutes
1.7 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -22 db and -23 db.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

034L

Lord 153 PH 20 Isolator
Rated Load 20 lbs.
Test Load 20.36 lbs.
November 11, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	38.2	37.5	-0.1	.985
3	30.0	30.0	0.0	1.00
4	31.2	33.5	0.6	1.07
5	25.3	29.0	1.2	1.15
6	20.2	26.0	2.1	1.29
7	19.0	28.0	3.3	1.47
8	13.0	22.0	4.9	1.69
9	10.5	23.0	6.8	2.19
10.	8.0	24.7	9.9	3.09
10.5	3.7	21.5	15.5	5.82
11	3.0	19.7	16.4	6.57
11.5	2.2	23.0	20.5	10.5
12	1.0	21.3	26.2	21.3
12.25	0.9	20.5	27.2	22.8
12.5	1.5	19.2	22.2	12.8
13	2.1	13.5	16.6	6.45
13.5	3.7	17.0	13.2	4.59
14.5	5.4	15.4	9.2	2.86

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
15	5.20	14.6	9.50	19.6	5.0	1.82
16	3.50	10.9	5.00	14.0	3.1	1.43
17	5.80	15.2	6.25	16.0	0.8	1.08
18	8.50	18.6	6.85	16.8	-1.8	.806
19	5.90	15.0	4.00	12.0	-3.0	.677
20	13.0	22.4	7.90	18.0	-4.4	.608
22	17.2	24.7	7.90	18.0	-6.7	.459
25	19.6	25.8	6.20	15.9	-9.9	.316
30	9	39.1	15.8	23.9	-15.2	.175
40	118	41.6	11.3	21.3	-20.3	.960
50	149	43.4	9.60	19.7	-23.7	.644
60	236	47.4	10.2	20.3	-27.1	.0435
70	72.0	37.1	2.24	7.0	-30.1	.0311
80	123	42.0	2.93	9.4	-32.6	.0238
89	258	48.3	5.00	13.9	-34.4	.0194

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 153 PH 20 Isolator
Rated Load 20 lbs.
Test Load 20.36 lbs.
November 11, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
100	305	49.8	4.73	13.5	-36.3	.0155
150	338	50.6	2.18	6.8	-43.8	.00645
200	243	47.8	.900	-1.0	-48.8	.00370
320	249	47.9	.350	-9.1	-57.0	.001405
400	212	46.6	.165	-15.7	-62.3	.000780
500	310	49.9	.165	-19.7	-65.8	.000533
600	279	48.9	.181	-14.8	-64.7	.000650
700	464	53.4	.316	-10.0	-63.4	.000783
2700	1920	65.7	.420	-7.5	-73.2	.000218
4650	370	51.4	.123	-18.0	-69.4	.000332
6800	720	57.2	.400	-7.8	-65.0	.000555

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
1	3.5
2	7.0
3	10.5
5	18.0
7	25.7
9	33.7
11	41.9
13	50.0
15	58.6
17	67.5
19	76.1
21	85.6
23	95.0
26	109.0
27	114.2
29	123.4
31	133.2
33	142.8

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 153 PH 20 Isolator
Rated Load 20 lbs.
Test Load 20.36 lbs.
November 11, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

3.5 thousandths of an inch
3.0 after ½ minute
2.5 after 1 minute
2.0 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -22.5 db and -23 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 20 Isolator
Rated Load 20 lbs.
Test Load 20.36 lbs.
November 16, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmissibility
2	23.0	23.0	0.0	1.00
3	18.7	19.0	0.5	1.02
4	24.1	26.1	0.7	1.08
5	13.6	17.2	2.3	1.26
6	11.0	14.2	2.5	1.29
7	15.2	24.4	4.1	1.60
8	6.4	13.5	6.6	2.11
9	5.3	16.3	9.9	3.08
10	2.2	20.0	19.3	9.09
10.5	1.8	18.0	20.0	10.0
11	2.0	16.2	18.3	8.10
11.5	4.0	20.3	14.2	5.08
12	6.6	21.4	10.4	3.24
12.5	8.8	20.5	7.0	2.33
13	11.0	19.0	4.7	1.73
14	13.5	15.5	1.2	1.15

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
15	20.5	26.3	21.8	26.8	0.6	1.07
15.5	9.30	19.4	7.61	17.7	-1.7	.817
16	4.80	13.5	3.90	12.0	-1.5	.813
17	4.80	13.5	3.30	10.5	-3.0	.688
18	6.45	16.2	3.60	11.1	-5.1	.558
19	31.6	30.0	12.4	22.0	-8.0	.393
20	36.0	31.2	13.5	22.7	-8.5	.375
25	35.2	31.0	7.30	17.3	-13.7	.207
30	35.2	31.0	4.90	13.8	-17.2	.142
40	31.6	30.0	2.42	7.7	-22.3	.0767
50	31.6	30.0	1.59	3.9	-26.1	.0503
60	31.6	30.0	1.10	1.0	-29.0	.0348
70	140	43.0	3.90	12.0	-31.0	.0279
80	86.0	38.5	1.50	3.5	-35.0	.0175
90	147	43.3	2.20	6.9	-36.4	.0150
100	293	49.4	3.58	11.1	-38.3	.0119
130	352	51.0	2.48	7.9	-43.1	.00705

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 20 Isolator
Rated Load 20 lbs.
Test Load 20.36 lbs.
November 16, 1949

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
165	366	51.3	1.32	2.5	-48.8	.00361
200	352	51.0	1.103	0.3	-50.7	.00293
252.5	280	49.0	.480	-6.3	-55.3	.00172
300	280	49.0	.395	-7.9	-56.7	.00141
350	285	49.2	.262	-11.6	-60.8	.000920
400	264	48.5	.150	-16.5	-65.0	.000568
500	278	48.8	.146	-16.7	-65.5	.000522
595	329	50.4	.195	-14.2	-64.6	.000593
700	496	53.9	.333	-9.4	-63.3	.000672
1850	490	53.8	.250	-12.0	-65.8	.000510
2500	650	56.2	.490	-6.2	-62.4	.000754
9000	2.95	9.5	.610	-4.2	-13.7	.207

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
1	3.8
2	7.5
4	15.5
6	23.7
8	32.5
10	41.3
12	50.3
14	59.5
16	68.9
18	78.7
20	88.6
22	98.7
23	104.6
26	119.7
28	130.8
30	142.0

Test Data (cont'd) 035L
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 20 Isolator
Rated Load 20 lbs.
Test Load 20.36 lbs.
November 16, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

3.1 thousandths of an inch
2.0 after ½ minute
1.5 after 1 minute
1.0 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -19 db and -20 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

036M

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1733.2 Isolator
Rated Load 20 - 32 lbs.
Test Load 20.36 lbs.
November 10, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	70.0	68.5	-0.2	.980
3	47.0	47.2	0.1	1.01
4	51.0	54.0	0.7	1.06
5	46.0	49.0	0.7	1.07
6	39.5	44.5	0.3	1.03
7	26.0	31.0	1.4	1.19
8	26.0	34.0	2.4	1.31
9	26.0	39.0	3.5	1.50
10	23.5	40.0	4.6	1.71

Frequency*** cps	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
11	6.20	16.0	12.0	22.0	6.0	1.94
12	4.10	12.5	10.0	20.0	7.5	2.44
13	4.50	13.0	16.0	24.0	11.0	3.56
14	2.90	7.0	22.0	27.0	20.0	7.58
14.5	1.10	1.0	11.0	21.0	20.0	10.0
15	2.50	8.0	20.0	26.0	18.0	8.00
16	5.90	15.2	23.5	27.4	12.2	3.98
17	9.00	19.0	23.0	27.2	8.2	2.56
18	13.00	22.5	23.5	27.4	4.9	1.81
19	18.00	25.0	23.5	27.4	2.4	1.30
20	23.5	27.4	23.5	27.4	0.0	1.00
21	125.	42.0	82.0	38.4	-3.6	.653
25	330.	50.5	120.0	41.7	-8.8	.396
30	82.0	38.5	24.5	27.7	-10.8	.293
40	108.	40.7	16.3	24.2	-16.5	.151
50	115.	41.3	11.0	21.0	-20.3	.0956
60	180.	45.0	12.0	21.8	-23.2	.0667
70	57.0	35.0	2.90	9.5	-25.5	.0509
80	250.	48.0	9.80	19.9	-28.0	.0392
90	420.	52.5	14.0	22.5	-30.0	.0334
100	410.	52.4	9.60	19.6	-32.8	.0234
155	125.	42.0	1.38	2.8	-39.2	.0110
200	250.	48.0	1.59	4.0	-44.0	.00636
250	316.	50.0	1.30	2.4	-47.6	.00412

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1733.2 Isolator
Rated Load 20 -32 lbs.
Test Load 20.36 lbs.
November 10, 1949

Frequency*** cps	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
270	305.	49.7	1.00	0.0	-49.7	.00328
350	325.	50.3	.710	-3.0	-53.3	.00218
390	348.	50.8	.600	-4.4	-55.2	.00172
450	348.	50.8	.560	-5.1	-55.9	.00161
510	302.	49.7	.305	-10.3	-60.0	.00101
570	310.	49.8	.270	-11.3	-62.1	.000872
600	335.	50.6	.211	-13.5	-64.1	.000631
701	430.	52.7	.320	-10.3	-63.0	.000745
800	500.	53.9	.272	-11.3	-65.2	.000545
880	619.	56.1	.380	-8.3	-64.4	.000615
1200	4900.	73.7	1.59	4.0	-69.7	.000324
2330	1660.	64.4	.510	-6.0	-70.4	.000307
4300	296.	49.5	.440	-7.0	-56.5	.00149
5000	26.0	28.3	.195	-14.3	-42.6	.00750
6800	2040.	66.2	.270	-11.3	-77.5	.00132
9000	3.10	9.9	.810	-1.8	-11.7	.261

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -23 db and -27 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd) 036M
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1733.2 Isolator
Rated Load 20 - 32 lbs.
Test Load 20.36 lbs.
November 10, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

2.0 thousandths of an inch
0.6 after ½ minute
0.3 after 1 minute
0.0 after 2 minutes

036M

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1733.2 Isolator
Rated Load 20 - 32 lbs.
Test Load 40 lbs.
November 10, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	28.0	27.5	-0.2	.982
3	36.0	35.0	-0.3	.973
4	23.5	22.0	-0.6	.937
6	18.7	26.5	3.1	1.14
7	13.0	24.0	5.3	1.84
8	9.0	23.2	8.3	2.58
8.5	5.6	18.0	10.1	3.22
9	4.0	15.0	11.5	3.75
9.5	3.0	12.5	12.3	4.17
9.7	2.0	17.0	18.5	8.50
10.	3.0	17.0	15.1	5.67
10.5	3.6	19.0	14.5	5.28
11	5.6	17.4	9.9	3.11
12	7.6	14.6	5.7	1.92
13	9.5	16.0	4.5	1.686
14	11.2	10.6	-0.4	.946

Frequency*** cps	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
15	5.00	14.0	3.90	11.8	-2.2	.780
17	3.90	11.8	2.00	6.0	-5.8	.513
20	22.0	27.0	7.40	17.0	-10.0	.356
25	152.	43.6	25.0	28.0	-15.6	.164
30	14.9	23.4	1.92	5.7	-17.7	.129
36	12.4	22.0	1.10	1.0	-21.0	.0887
40	33.8	30.7	2.38	7.5	-23.2	.0704
50	34.5	30.8	1.51	3.6	-27.2	.0437
60	41.8	32.5	1.26	2.1	-30.4	.0301
70	77.5	37.8	1.68	4.4	-33.4	.0217
80	170.	44.6	3.05	9.7	-34.9	.0179
90	167.	44.4	2.24	7.0	-37.4	.0134
100	158.	43.9	1.79	5.0	-38.9	.0113
150	225.	47.0	1.10	1.0	-46.0	.00489
200	362.	51.2	1.00	0.0	-51.2	.00276
250	336.	50.6	.620	-4.1	-54.7	.00179
300	241.	47.6	.340	-9.3	-56.9	.00141
350	342.	50.8	.305	-10.3	-61.1	.000892
490	300.	49.6	.167	-15.6	-65.2	.000557

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1733.2 Isolator
Rated Load 20 - 32 lbs.
Test Load 40 lbs.
November 10, 1949

Frequency*** cps	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
570	219.	46.8	.207	-13.7	-60.5	.000945
655	391.	51.9	.228	-12.8	-64.7	.000583
695	430.	52.8	.290	-10.7	-63.5	.000674
800	658.	56.4	.275	-11.2	-67.6	.000418
1000	875.	58.8	.460	-6.7	-65.5	.000526
1650	344.	50.8	.275	-11.2	-62.0	.000799
2350	490.	53.8	.200	-14.0	-67.8	.000408
2500	750.	57.6	.300	-10.4	-68.0	.000400
6300	466.	53.0	23.0	7.2	-45.8	.0516
7420	120.	41.7	.200	-14.0	-55.7	.00167
8400	6.05	15.7	.395	-8.0	-23.7	.0653

Static Test Data

Load in pounds.	Deflection in thousandths of an inch.
0	0.0
1	2.3
2	4.6
4	9.6
6	14.3
8	19.0
10	24.0
12	29.5
14	34.4
16	39.6
18	45.3
20	51.0
22	56.7
25	65.0
27	70.6
28	73.5
30	79.5
32	85.2

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

038B

Barry 712-13 Isolator
Rated Load 30-125 lbs.
Test Load 66.1 lbs.
December 20, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	10.3	12.8	1.2	1.24
2.6	10.3	14.6	3.0	1.42
3	6.9	12.0	4.8	1.74
3.4	5.4	11.7	8.7	2.69
3.8	3.1	10.2	10.4	3.29
4	2.2	10.2	13.4	4.64
4.4	0.4	11.0	28.8	27.5
4.6	0.8	14.8	25.3	18.5
4.8	1.1	8.7	18.0	7.91
5	2.3	10.1	13.0	4.39
6	7.8	9.2	1.6	1.18
7	10.6	6.9	-3.7	.651
8	9.9	4.0	-7.8	.404
9	8.9	2.3	-11.4	.269
10	10.3	2.3	-13.1	.223
12	11.4	1.5	-17.6	.132

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
14	10.0	20.0	1.20	1.5	-18.5	.120
16	25.0	28.0	2.00	6.0	-22.0	.0800
18	39.5	32.0	2.50	8.0	-24.0	.0633
20	30.0	29.6	1.52	3.6	-26.0	.0507
25	30.7	29.8	1.00	0.0	-29.8	.0326
30	45.8	33.2	1.00	0.0	-33.2	.0218
35	60.6	35.7	1.00	0.0	-35.7	.0165
40	77.5	37.8	1.00	0.0	-37.8	.0129
50	117	41.5	1.00	0.0	-41.5	.00855
60	159	44.0	1.00	0.0	-44.0	.00629
70	208	46.4	1.00	0.0	-46.4	.00481
80	279	48.9	1.00	0.0	-48.9	.00358
90	304	49.7	1.00	0.0	-49.7	.00329
100	301	49.6	1.00	0.0	-49.6	.00332
130	415	62.4	1.00	0.0	-52.4	.00241
140	443	53.0	1.00	0.0	-53.0	.00226
150	390	51.8	1.00	0.0	-51.8	.00257

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 712-13 Isolator
Rated Load 30-125 lbs.
Test Load 66.1 lbs.
December 20, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
160	347	50.8	1.00	0.0	-50.8	.00288
170	268	48.6	1.00	0.0	-48.6	.00374
180	167	44.4	1.00	0.0	-44.7	.00599
190	44.0	33.0	1.00	0.0	-33.0	.0227
200	97.0	39.7	1.00	0.0	-39.7	.0103
210	210	46.4	1.00	0.0	-46.4	.00476
220	360	51.2	1.00	0.0	-51.2	.00278
230	337	50.6	.700	-3.0	-53.6	.00208
250	236	47.5	.470	-6.6	-54.1	.00199
290	242	47.7	.500	-6.0	-53.7	.00207

The Isolator Spring resonated at some high harmonic when driven at 300 and 340 cps.

400	198	45.9	.700	-3.0	-48.9	.00353
500	169	44.5	.200	-14.0	-58.5	.00118
645	94.0	39.5	.500	-6.0	-45.5	.00532

Peak occurs at 645 cps which starts at 625 cps and continues to 680 cps.

680	250	48.0	.200	-14.0	-62.0	.000800

From 680 cps to 3190 cps harmonics occur which make it impossible to make readings.

3190	101	40.2	1.00	0.0	-40.2	.00990
3320	192	45.7	1.00	0.0	-45.7	.00521
3380	186	45.4	.860	-1.3	-46.7	.00462
3340	193	45.8	6.15	15.8	-30.0	.0319
3390	132	42.5	2.20	6.8	-35.7	.0167
4000	54.1	34.9	1.00	0.0	-34.9	.0185
4410	192	45.7	.760	-2.3	-48.0	.00396
4760	338	50.6	6.00	15.6	-35.0	.0178
4790	76.0	37.7	1.00	0.0	-37.7	.0143
4900	160	44.2	.680	-3.3	-47.5	.00425
4940	150	43.4	2.20	6.8	-36.6	.0147
5100	195	45.9	.450	-6.9	-39.0	.0231

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 712-13 Isolator
Rated Load 30-125 lbs.
Test Load 66.1 lbs.
December 20, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
5350	100	40.0	5.60	15.0	-25.0	.0560
6010	94.0	39.6	25.0	28.0	-11.6	.266
6020	275	48.8	67.0	36.6	-12.2	.244
6120	224	47.0	39.0	31.9	-15.1	.0174
6190	260	48.4	28.2	29.0	-19.4	.0185
6450	500	54.0	48.7	33.7	-20.3	.0975
6660	202	46.2	2.40	7.5	-38.7	.0119
6790	60.0	35.6	10.0	20.0	-15.6	.167
6860	128	42.2	6.90	16.8	-25.4	.0539
7000	211	46.5	10.0	20.0	-26.5	.0475
7040	92.0	39.4	.970	-0.1	-39.5	.0106
7140	78.5	37.9	5.75	15.2	-22.7	.0733
7180	68.5	36.8	2.30	6.2	-30.6	.0336
7260	81.0	38.2	5.70	15.2	-23.0	.0704
7300	68.5	36.8	2.74	8.8	-28.0	.0400
7400	97.0	39.8	25.0	28.0	-11.8	.258
7460	101	40.1	14.6	23.3	-16.8	.145
7580	103	40.3	4.00	12.1	-28.2	.0388
7600	94.0	39.5	12.8	22.2	-17.3	.136
7760	103	40.4	13.2	22.5	-17.9	.128
7920	26.0	28.3	.490	-6.2	-34.5	.0189
8300	9.70	19.8	11.6	21.3	1.5	1.20
8320	4.10	12.3	10.0	20.0	7.7	2.44
8500	5.60	14.9	5.4	14.6	-0.3	.965
9120	1.90	4.7	4.4	12.6	7.9	2.32
10,000	2.32	7.3	1.24	2.0	-5.3	.535
10,400	18.7	25.4	5.4	14.6	-10.8	.288
10,600	15.4	23.8	4.2	12.5	-11.3	.272
11,900	9.25	19.4	.540	-5.3	-24.7	.0585
12,550	7.90	18.0	1.50	3.5	-14.5	.190
12,900	6.86	16.8	3.70	11.7	-5.1	.540
13,100	6.50	16.3	4.50	13.2	-3.1	.693
13,700	10.0	20.0	5.80	15.3	-4.7	.580
17,450	11.7	21.5	1.17	1.5	-20.0	.100
17,600	33.2	30.5	2.65	8.5	-22.0	.0800
17,900	15.6	23.8	16.0	24.0	0.2	1.03
18,500	16.3	24.2	.930	-0.5	-24.7	.0553

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

038B

Barry 712-13 Isolator
Rated Load 30-125 lbs.
Test Load 66.1 lbs.
December 20, 1949

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -24 db and -26 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

038B

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 712-13 Isolator
Rated Load 30-125 lbs.
Test Load 67.6 lbs.
February 22, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
6	1.10	1.0	1.00	0.0	-1.0	.910
7	2.00	6.0	1.10	1.0	-5.0	.500
8	2.60	8.4	1.00	0.0	-8.4	.385
9	3.50	10.9	1.00	0.0	-10.9	.286
10	4.50	13.1	1.00	0.0	-13.1	.222
20	20.0	26.0	1.00	0.0	-26.0	.0500
50	45.0	33.1	.330	-9.5	-42.6	.00735
75	480	53.6	2.00	6.0	-47.6	.00417
100	400	52.0	1.00	0.0	-52.0	.0025
200	175	44.8	2.10	6.5	-38.3	.0012
295	150	43.5	.360	-8.9	-52.4	.00072
400	230	47.3	.470	-6.6	-53.9	.000204
500	190	45.6	.280	-11.0	-56.6	.000147
600	280	49.0	1.00	0.0	-49.0	.00357
700	293	49.4	.950	-8.0	-57.4	.00398
800	377	51.5	.950	-8.0	-59.5	.00252
880	160	44.0	.300	-10.4	-54.4	.00188
1440	157	43.8	.440	-7.1	-50.9	.0028
2020	350	49.9	.525	-5.6	-55.4	.0015
3410	190	45.6	.255	-11.8	-57.4	.00124
3960	100	40.0	.515	-5.9	-45.9	.00515
4220	155	43.8	1.00	0.0	-43.8	.00645
4500	118	41.6	1.00	0.0	-41.6	.0085
4810	234	47.4	3.16	10.0	-37.4	.0135
5060	94.0	39.5	32.5	30.3	-9.2	.346
5200	47.2	33.8	25.0	28.0	-5.8	.530
5400	21.1	26.5	2.00	6.0	-20.5	.095
5640	43.5	32.8	3.85	11.7	-21.1	.0885
5840	65.8	36.4	1.25	2.0	-34.4	.0190
6300	278	48.8	5.65	15.0	-33.8	.0202
6400	1080	60.8	13.6	22.7	-38.1	.0126
6500	1690	64.5	43.0	32.8	-31.7	.0254
6600	353	51.0	13.6	22.6	-28.4	.0386
6800	63.0	36.0	2.00	6.0	-30.0	.0318
7480	16.4	24.3	.960	-0.4	-24.7	.0605
7600	62.0	35.9	3.95	12.0	-23.9	.0636
10,600	7.6	17.7	1.10	1.0	-16.7	.145

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 712-13 Isolator
Rated Load 30-125 lbs.
Test Load 67.6 lbs.
February 22, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	41.3
10	81.8
15	124
20	175
30	241
40	317
50	392
55	427
60	468
65	505
70	545
80	618
90	689
100	760
115	866
120	894
130	963
140	1036
150	1101

NOTE: The elastic member of this isolator is a steel spring which has no appreciable set.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -21 db and -25 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data 039L
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 156 PH 13 Isolator
Rated Load 6-13 lbs.
Test Load 9.89 lbs.
April 10, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	16.0	18.0	1.1	1.13
4	10.5	12.5	1.6	1.19
6	6.0	11.0	5.3	1.83

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
7	1.00	0.0	17.0	24.6	24.6	17.0
7.5	1.00	0.0	22.5	27.0	27.0	22.5
8	1.00	0.0	13.5	22.6	22.6	13.5
8.5	1.00	0.0	8.40	18.5	18.5	8.40
9	1.00	0.0	5.40	14.6	14.6	5.40
10	1.00	0.0	2.80	9.0	9.0	2.80
11	1.00	0.0	1.80	5.1	5.1	1.80
12	1.00	0.0	1.40	2.4	2.4	1.40
13	1.00	0.0	1.00	0.0	0.0	1.00
14	10.0	20.0	7.50	17.5	-2.5	.750
15	10.0	20.0	6.30	16.0	-4.0	.630
16	10.0	20.0	5.60	14.9	-5.1	.560
17	10.0	20.0	4.55	13.3	-6.7	.455
18	10.0	20.0	3.90	11.9	-8.1	.390
19	10.0	20.0	3.50	10.9	-9.1	.350
20	10.0	20.0	3.10	9.9	-10.1	.310
21	10.0	20.0	2.80	9.0	-11.0	.280
22	10.0	20.0	2.50	8.0	-12.0	.250
23	10.0	20.0	2.25	7.0	-13.0	.225
24	10.0	20.0	2.05	6.3	-13.7	.205
25	10.0	20.0	1.85	5.4	-14.6	.185
30	10.0	20.0	1.10	1.7	-18.3	.110
35	100	40.0	9.10	19.4	-20.6	.0910
40	100	40.0	6.40	16.1	-23.9	.0640
45	100	40.0	5.10	14.0	-26.0	.0510
50	100	40.0	4.25	12.7	-27.3	.0425
60	100	40.0	2.65	8.5	-31.5	.0265
70	100	40.0	2.20	6.9	-33.1	.0220
80	100	40.0	1.61	4.3	-35.7	.0161

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 156 PH 13 Isolator
Rated Load 6-13 lbs.
Test Load 9.89 lbs.
April 10, 1950

Frequency cps***	Accelerometer Readings				db change	Transmissibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
90	100	40.0	1.25	2.0	-38.0	.0125
100	500	53.9	5.00	13.9	-40.0	.0100
125	500	53.9	3.40	10.7	-43.2	.00680
150	500	53.9	2.30	7.3	-46.6	.00460
200	500	53.9	1.25	2.0	-51.9	.00250
250	500	53.9	.840	-1.5	-55.4	.00168
300	500	53.9	.570	-5.0	-58.9	.00114
350	450	53.1	.435	-5.1	-58.2	.000967
400	440	52.9	.275	-11.3	-64.1	.000611
520	395	52.0	.680	-3.4	-55.4	.00172
600	300	49.5	.170	-13.0	-62.5	.000567
980	460	53.2	.240	-12.4	-65.6	.000522
1150	440	52.8	.370	-8.6	-61.4	.000841
1430	600	55.6	.840	-1.5	-57.1	.00140
1600	700	57.0	.650	-3.9	-60.9	.000928
1750	1110	61.3	.280	-11.0	-72.3	.000252
1850	2450	67.9	1.00	0.0	-67.9	.000408
2400	580	55.4	1.00	0.0	-55.4	.00172
2750	310	49.9	.220	-13.2	-63.1	.000710
2890	430	52.7	.310	-10.0	-62.8	.000721
4000	1000	60.0	.375	-8.5	-68.5	.000375
4500	440	52.9	.280	-11.0	-63.9	.000636
6500	1110	61.0	.450	-6.9	-67.9	.000409
8050	340	50.6	.600	-4.4	-55.0	.001765
8600	38.0	31.5	2.10	6.5	-25.0	.0553
9000	3.70	11.4	2.00	6.0	-5.4	.540
10,000	165	44.4	.420	-7.4	-51.8	.00254

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
2	20.5
4	43.0
6	65.5
8	89.0

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 156 PH 13 Isolator
Rated Load 6-13 lbs.
Test Load 9.89 lbs.
April 10, 1950

Load in pounds	Deflection in thousandths of an inch
10	111.5
14	156.0
18	197.0
22	235.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

3.8 thousandths of an inch
2.2 after ½ minute
1.2 after 1 minute
.5 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -20 db and -20 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 PH 20 Isolator
Rated Load 20-40 lbs.
Test Load 20.36 lbs.
November 18,1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	22.0	20.8	-0.5	.945
3	25.0	24.5	-0.1	.980
4	24.5	25.2	0.2	1.03
5	24.0	24.6	0.2	1.03
6	21.2	24.0	1.0	1.13
7	17.4	22.6	2.3	1.30
8	15.6	22.2	3.0	1.42
9	15.0	21.4	3.1	1.43
10	12.0	24.5	6.4	2.04
11	8.5	19.7	7.4	2.32
12	5.3	19.4	11.4	3.66
12.5	2.9	18.3	16.1	6.32
13	1.9	17.2	19.2	9.05
13.5	0.9	15.9	25.0	17.7
14	1.1	15.0	22.8	13.6

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
14.5	.980	-0.2	6.70	16.7	16.9	6.84
15	2.60	8.3	10.0	20.0	11.7	3.85
16	3.80	11.5	8.60	18.8	7.3	2.26
17	5.00	14.0	10.0	20.0	6.0	2.00
18	7.00	17.0	9.40	19.5	2.5	1.34
19	9.00	19.0	9.40	19.5	0.5	1.03
20	11.0	21.0	10.0	20.0	-1.0	.909
25	110	41.0	44.8	33.1	-7.9	.408
30	63.5	36.1	16.2	24.2	-11.9	.255
35	116	41.5	20.6	26.3	-15.2	.178
40	110	40.9	14.4	23.2	-17.7	.131
45	40.5	32.2	4.30	12.7	-19.5	.106
50	63.5	36.1	4.91	13.8	-22.3	.0774
60	150	43.5	8.82	18.9	-24.6	.0588
70	35.0	31.0	1.40	3.0	-28.0	.0400
80	140	43.0	5.20	14.3	-28.7	.0372
90	272	48.8	6.90	16.8	-32.0	.0254
100	475	53.7	9.20	19.4	-34.3	.0194

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 PH 20 Isolator
Rated Load 20-40 lbs.
Test Load 20.36 lbs.
November 18, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
150	400	52.4	3.72	11.4	-41.0	.00931
200	360	51.1	1.88	5.5	-45.6	.00522
250	281	49.0	.980	-0.2	-49.2	.00349
300	305	49.8	.800	-1.9	-51.7	.00262
350	329	50.4	.600	-4.3	-54.7	.00183
400	299	49.5	.425	-7.3	-56.8	.00142
450	320	50.2	.410	-7.7	-57.9	.00128
500	316	50.0	.340	-9.3	-59.3	.00108
600	299	49.5	.316	-10.0	-59.5	.00106
750	335	50.6	.330	-9.6	-60.2	.000985
1000	212	46.6	.472	-6.5	-53.1	.00212
2700	1160	61.4	.710	-3.0	-64.4	.000612
3000	1220	61.9	.890	-1.0	-62.9	.000730

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
2	5.2
4	10.4
7	18.7
11	30.0
15	42.0
18	51.5
22	64.3
26	76.7
30	89.6
31	92.8

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 PH 20 Isolator
Rated Load 20-40 lbs.
Test Load 20.36 lbs.
November 18, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

5.0 thousandths of an inch
4.0 after ½ minute
3.6 after 1 minute
3.4 after 1½ minutes
3.2 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -19 db and -25 db.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

061M

MB 1735.6 Isolator
Rated Load 35-56 lbs.
Test Load 40.0 lbs.
December 30, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	22.7	22.6	-0.1	.995
3	30.0	31.0	0.3	1.03
4	15.6	16.0	0.2	1.02
5	21.0	20.5	-0.2	.975
6	14.7	15.5	0.6	1.06
7	16.7	19.1	1.2	1.14
8	10.6	13.1	1.9	1.23
9	13.4	17.3	2.2	1.29
10	11.6	17.3	3.5	1.49
11	3.9	5.0	2.1	1.28
12	5.2	8.2	4.0	1.58
13	4.5	11.0	7.8	2.45
14	3.3	10.0	10.0	3.15
15	1.8	8.9	14.0	4.95

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
16	.620	-4.0	4.70	13.5	17.5	7.58
16.5	.800	-2.0	7.20	17.0	19.0	9.00
17	1.20	1.5	8.00	18.0	16.5	6.67
18	1.90	5.5	8.00	18.0	12.5	4.21
19	2.70	8.5	7.50	17.5	9.0	2.78
20	3.75	11.5	7.50	17.5	6.0	2.00
21	4.70	13.5	7.40	17.4	3.90	1.57
22	5.80	15.3	7.20	17.2	1.9	1.24
23	7.00	17.0	7.40	17.4	0.4	1.048
25	40.0	32.0	24.9	27.8	-4.2	.623
30	8.60	18.6	3.90	12.0	-6.6	.455
35	23.0	27.4	6.80	16.7	-10.7	.296
40	28.0	29.0	6.00	15.6	-13.5	.214
50	40.0	32.0	5.00	14.0	-18.0	.125
60	50.0	34.0	4.55	13.3	-20.7	.0910
70	72.0	37.0	4.65	13.4	-23.6	.0646
80	110	41.0	5.40	14.6	-26.4	.0491
90	250	48.0	9.40	19.5	-28.5	.0376
100	250	48.0	7.60	17.6	-30.4	.0304

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1735.6 Isolator
Rated Load 35-56 lbs.
Test Load 40.0 lbs.
December 30, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
130	220	46.8	4.00	12.0	-34.8	.0182
160	290	49.4	4.70	11.3	-38.1	.0162
200	260	48.4	2.20	6.8	-41.6	.00846
250	400	52.0	2.08	6.4	-45.6	.00520
300	325	50.4	1.35	2.5	-47.9	.00415
350	370	51.5	1.00	0.0	-51.5	.00271
400	290	49.4	.620	-4.0	-53.4	.00214
500	330	50.5	.520	-5.6	-56.1	.00157
600	480	53.5	.450	-7.0	-60.5	.000940
700	680	56.6	.700	-3.0	-59.6	.00103
800	1490	63.4	1.40	3.0	-60.4	.000940
900	600	55.5	.400	-8.0	-63.5	.000667
1000	290	49.4	.300	-10.5	-59.9	.00104
1220	200	46.0	.400	-8.0	-54.0	.00200
1700	370	51.4	.310	-10.2	-61.6	.000840
2490	450	53.0	.300	-10.5	-63.5	.000667
3050	290	49.4	.350	-9.0	-58.4	.00121
6300	430	52.6	6.80	16.6	-36.0	.0158

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
2	2.0
6	5.8
11	12.2
16	18.4
20	23.4
26	32.5
30	38.4
34	44.1
38	50.4
42	56.5
46	62.7
52.8	73.0
58.8	82.3

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1735.6 Isolator
Rated Load 35-56 lbs.
Test Load 40.0 lbs.
December 30, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

12.0 thousandths of an inch
6.4 after ½ minute
4.7 after 1 minute
4.0 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -21 db and -20 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

062L

Lord 200 PH 35 Isolator
Rated Load 35 lbs.
Test Load 40.0 lbs.
November 29, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmissibility
2	21.0	21.2	0.1	1.01
3	17.6	19.2	0.9	1.09
4	25.8	27.2	0.5	1.05
5	19.0	22.0	1.3	1.16
6	15.6	18.7	1.7	1.20

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
9	2.00	6.0	3.50	11.0	5.0	1.75
10	2.50	8.0	5.20	14.5	6.5	2.08
11	1.70	4.5	5.20	14.5	10.0	3.06
12	1.10	1.0	6.20	16.0	15.0	5.64
12.5	1.00	0.0	8.50	8.5	18.5	8.50
13	1.00	0.0	9.00	19.0	19.0	9.00
15	2.35	7.5	8.20	18.3	10.8	3.49
17	5.40	14.5	8.50	18.5	4.0	1.57
19	10.0	20.0	10.0	20.0	0.0	1.00
24	60.0	35.5	40.0	32.0	-3.5	.667
30	140	43.0	30.0	29.5	-13.5	.214
40	230	47.0	27.5	28.8	-18.2	.119
50	130	42.4	10.0	20.0	-22.4	.0780
60	176	44.9	10.0	20.0	-24.9	.0568
70	100	40.0	4.15	12.5	-27.5	.0415
80	100	40.0	3.16	10.0	-30.0	.0316
90	203	46.2	5.00	14.0	-32.2	.0246
100	200	46.0	4.00	12.2	-33.8	.0200
130	430	52.8	5.00	14.0	-38.8	.0116
170	376	51.5	2.60	8.3	-43.2	.00692
200	190	45.6	1.00	0.0	-45.6	.00527
250	305	49.8	1.00	0.0	-49.8	.00328
300	282	49.0	.790	-2.0	-51.0	.00280
350	289	49.2	.535	-5.4	-54.6	.00185
400	310	49.9	.445	-7.0	-56.9	.00144
500	342	50.8	.395	-8.0	-58.8	.00115
600	485	53.7	.150	-7.5	-61.2	.000309
820	1000	60.0	.960	-0.3	-60.3	.000960

Test Data (cont'd) 062L

Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 PH 35 Isolator
Rated Load 35 lbs.
Test Load 40.0 lbs.
November 29, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
985	505	54.1	.490	-6.2	-60.3	.000970
1820	400	52.2	.790	-2.0	-54.2	.00198
2750	1610	64.3	.355	-9.0	-73.3	.000221
6300	635	56.0	11.0	21.0	-35.0	.0173
7600	184	45.3	.660	-3.5	-48.8	.00359
8400	20	26.0	.520	-5.7	-31.7	.0260

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
2	2.8
6	8.7
10	14.9
14	21.4
18	28.3
22	35.5
26	45.0
30	52.0
34	59.5
38	67.5
42	75.6
47	85.4

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

6.0 thousandths of an inch
4.5 after ½ minute
4.1 after 1 minute
3.8 after 1½ minutes
3.6 after 2 minutes.

Test Data (cont'd) 062L
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 PH 35 Isolator
Rated Load 35 lbs.
Test Load 40.0 lbs.
November 29, 1949

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -22 db and -18 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 35 Isolator
Rated Load 35 lbs.
Test Load 40.0 lbs.
December 1, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	15.6	15.2	-0.0	.975
3	12.5	13.5	0.8	1.08
4	12.0	14.2	1.5	1.18
5	12.7	15.8	2.0	1.24
6	10.1	14.3	3.2	1.41
7.5	2.7	14.3	14.0	5.30
8	2.4	13.7	15.1	5.70
8.5	2.2	24.0	20.7	10.9
9	0.8	13.5	24.5	16.9
9.5	1.1	26.0	27.4	23.6
10	2.5	23.5	19.5	9.40
10.5	4.0	22.0	14.8	5.50
11	5.5	18.7	10.5	3.37
12	9.0	15.5	4.7	1.72
13	8.4	9.0	0.7	1.07
14	10.2	9.2	-1.0	.903

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
15	4.70	13.5	2.80	9.0	-4.5	.596
17	5.90	15.2	2.40	7.5	-7.7	.408
20	10.0	20.0	2.80	9.0	-11.0	.280
25	50.0	34.0	8.00	18.1	-15.9	.160
30	27.4	28.8	2.00	9.6	-19.2	.109
40	31.8	30.1	1.90	5.7	-24.4	.0605
50	56.0	35.0	2.20	6.8	-28.2	.0393
75	100	40.0	1.68	4.4	-35.6	.0168
100	168	44.4	1.65	4.3	-40.1	.00985
130	182	45.2	10.0	0.0	-45.2	.00550
170	293	49.4	10.0	0.0	-49.4	.00342
200	400	52.1	10.0	0.0	-52.0	.00250
270	286	49.1	.400	-7.8	-56.9	.00140
350	269	48.6	.240	-12.4	-61.0	.000895
400	340	50.7	.220	-13.2	-60.9	.000646
500	440	53.0	2.40	-12.4	-65.4	.000546
720	515	54.2	.395	-8.0	-62.2	.000770

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 35 Isolator
Rated Load 35 lbs.
Test Load 40.0 lbs.
December 1, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
800	870	58.8	.540	-5.9	-64.2	.000620
900	435	52.8	.316	-10.0	-62.8	.000727
1000	350	51.0	.435	-7.2	-58.2	.00124
1200	231	47.3	.225	-13.0	-60.3	.000975
1770	485	53.7	.445	-7.0	-60.7	.000918
2500	310	62.5	.300	-10.4	-72.6	.000229
4600	590	55.4	.215	-13.3	-68.7	.000365
6050	250	48.0	.370	-8.7	-56.7	.00148
7400	230	47.0	.200	-14.0	-61.0	.000872

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
1	2.6
5	13.3
9	24.7
13	36.4
17	48.6
21	61.3
26	77.0
30	89.8
34	102.8
38	116.2
42	130.0
46	144.6

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 35 Isolator
Rated Load 35 lbs.
Test Load 40.0 lbs.
December 1, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

10.0 thousandths of an inch
5.5 after ½ minute
4.6 after 1 minute
3.6 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -19 and -21 db.

Test Data Mechanical Engineering Department Illinois Institute of Technology Navy Contract N7-onr-32904

Barry C-2045 Isolator
Rated Load 40-120 lbs.
Test Load 66.1 lbs.
December 8, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	26.2	26.4	0.0	1.00
3	18.3	19.0	0.4	1.04
4	18.2	18.5	0.2	1.02
5	18.7	18.7	0.0	1.00
6	13.6	14.2	0.5	1.05
7	9.7	9.5	-0.1	.980
8	12.7	14.0	1.0	1.10
9	18.0	20.2	1.1	1.12

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
12	3.80	11.5	4.30	12.7	1.2	1.13
13	3.30	10.5	4.00	12.0	1.5	1.21
15	2.70	8.5	3.50	11.0	2.5	1.29
16	3.16	10.0	4.20	12.5	2.5	1.35
17	2.50	8.0	3.70	11.4	3.4	1.48
18	2.20	7.0	3.40	10.6	2.6	1.54
19	2.90	9.3	5.00	14.0	4.7	1.72
20	3.10	9.9	6.13	15.8	5.9	1.97
22	2.02	6.1	5.20	14.3	8.2	2.58
24	1.40	3.0	4.95	13.9	10.9	3.54
26	1.00	0.0	6.00	15.6	15.6	6.00
27	1.00	0.0	7.55	17.6	17.6	7.55
28	1.00	0.0	7.05	17.0	17.0	7.05
29	1.00	0.0	6.71	16.6	16.6	6.71
30	1.00	0.0	4.82	13.7	13.7	4.82
32	1.00	0.0	2.80	9.0	9.0	2.80
34	1.00	0.0	1.92	5.7	5.7	1.92
36	1.00	0.0	1.43	3.2	3.2	1.43
38	1.00	0.0	1.14	1.3	1.3	1.14
40	2.00	6.0	1.85	5.3	-0.7	.925
42	2.00	6.0	1.59	4.0	-2.0	.785
44	2.00	6.0	1.33	2.6	-3.4	.665
50	10.0	20.0	4.60	13.3	-6.7	.460
60	10.0	20.0	3.04	9.7	-10.3	.304
70	10.0	20.0	1.96	5.8	-14.2	.196

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry C-2045 Isolator
Rated Load 40-120 lbs.
Test Load 66.1 lbs.
December 8, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
80	10.0	20.0	1.40	3.0	-17.0	.140
90	10.0	20.0	1.08	[illegible]	-19.2	.108
100	100	40.0	8.50	18.6	-21.4	.0850
130	100	40.0	4.91	13.8	-26.2	.0491
160	100	40.0	3.60	11.2	-28.8	.0360
200	100	40.0	2.22	6.9	-33.1	.0222
250	100	40.0	1.42	3.1	-36.9	.0140
300	100	40.0	1.06	0.6	-39.4	.0100
350	200	46.0	1.48	3.4	-42.6	.00740
400	400	52.1	1.84	5.3	-46.8	.00460
450	300	49.6	2.78	8.9	-38.7	.00925
500	208	46.4	1.00	0.0	-46.4	.00480
600	290	49.3	1.00	0.0	-49.3	.00345
700	350	50.9	1.00	0.0	-50.9	.00286
800	405	52.3	1.00	0.0	-52.3	.00247
900	349	50.5	1.00	0.0	-50.5	.00287
1000	225	47.0	.510	-6.0	-53.0	.00227
1500	100	40.0	1.18	1.5	-38.5	.0118
1950	248	47.9	.180	-15.0	-62.9	.000726
2450	400	52.2	.630	-4.0	-56.2	.00157
4500	395	52.0	.427	-7.3	-59.3	.00107
6500	425	52.8	2.79	8.9	-43.9	.00642
7500	141	43.0	2.10	6.5	-36.5	.0149
9120	2.06	6.5	.300	-10.4	-16.9	.145
10,900	10.4	20.4	.395	-8.0	-28.5	.0380
12,000	6.25	16.0	.395	-8.0	-24.0	.0634

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	9.0
20	28.1
40	42.2

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry C-2045 Isolator
Rated Load 40-120 lbs.
Test Load 66.1 lbs.
December 8, 1949

Load in pounds	Deflection in thousandths of an inch
60	51.4
80	60.1
100	68.8
120	76.1
140	84.1
160	91.0
180	97.2

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

1.9 thousandths of an inch
1.3 after ½ minute
1.1 after 1 minute
0.9 after 1½ minute
0.7 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -24 db and -27 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Hamilton Kent H40 Isolator
Rated Load 40 lbs.
Test Load 40.0 lbs.
November 28, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	20.0	20.6	0.3	1.03
4	14.4	15.5	0.6	1.08
6	18.2	20.3	1.1	1.12
7	8.4	10.3	1.8	1.23
9	7.5	10.7	3.0	1.43
11	8.3	12.0	3.2	1.45

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
13	1.00	0.0	1.98	5.8	5.8	1.98
15	1.00	0.0	2.28	7.1	7.1	2.28
16	1.00	0.0	2.30	7.3	7.3	2.30
17	1.20	1.7	3.16	10.0	8.3	2.63
18	1.39	2.9	5.10	14.1	11.2	3.67
19	1.71	4.7	7.00	16.9	12.2	4.09
20	0.710	-3.0	3.40	10.7	13.7	4.79
20.5	1.00	0.0	4.90	13.8	13.8	4.90
21	1.00	0.0	4.50	13.1	13.1	4.50
21.2	1.00	0.0	4.38	12.9	12.9	4.38
22	1.00	0.0	4.15	12.5	12.5	4.15
23	1.00	0.0	3.30	10.5	10.5	3.30
24	1.00	0.0	2.67	8.5	8.5	2.67
25	1.00	0.0	2.23	7.0	7.0	2.23
26	1.00	0.0	1.90	5.6	5.6	1.90
27	1.00	0.0	1.60	4.1	4.1	1.60
28	1.00	0.0	1.37	2.8	2.8	1.37
29	1.00	0.0	1.19	1.6	1.6	1.19
30	1.00	0.0	1.10	1.0	1.0	1.10
31	2.00	6.0	1.82	5.2	-1.2	.910
33	2.00	6.0	1.50	3.5	-2.5	.750
35	2.00	6.0	1.22	1.8	-4.2	.610
40	4.00	12.2	1.70	4.6	-7.6	.425
50	6.00	15.6	1.44	3.2	-12.8	.240
60	7.00	15.9	1.10	1.0	-14.9	.143
70	8.70	18.8	1.00	0.0	-18.8	.115
80	10.9	20.9	1.00	0.0	-20.9	.0917

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Hamilton Kent H40 Isolator
Rated Load 40 lbs.
Test Load 40.0 lbs.
November 28, 1949

Frequency cps***	Accelerometer Readings: Driver Millivolts	Driver db	Weight Millivolts	Weight db	db change	Transmissibility
90	100	40.0	6.70	16.6	-23.4	.0670
100	94.5	39.6	5.05	14.0	-25.6	.0535
130	74.5	37.5	2.50	8.0	-29.5	.0336
160	161	44.2	4.00	12.2	-32.0	.0248
200	180	45.1	3.00	9.6	-35.5	.0167
250	202	46.1	2.00	6.0	-40.1	.00990
300	123	41.9	1.00	0.0	-41.9	.00812
350	152	43.6	1.00	0.0	-43.6	.00658
400	182	45.2	1.00	0.0	-45.2	.00550
450	200	46.0	1.00	0.0	-46.0	.00500
500	227	47.1	1.00	0.0	-47.1	.00440
550	154	43.8	.680	-3.3	-47.1	.00442
600	231	47.3	1.00	0.0	-47.3	.00434
700	285	48.1	1.25	2.0	-46.0	.00439
800	295	49.4	2.00	6.0	-43.4	.00689
900	143	43.2	1.20	1.7	-41.5	.00840
1000	415	52.5	1.29	2.2	-50.3	.00311
1210	378	51.5	.710	-3.0	-48.5	.00188
1770	580	55.2	1.40	3.0	-52.2	.00242
3820	725	57.3	.270	-12.3	-69.6	.000373
4600	590	55.4	.316	[illegible]	-65.4	.000536
5190	126	42.1	.316	-10.0	-52.1	.00251
6320	380	51.6	7.9	18.0	-33.6	.0208
7540	210	46.5	.750	-2.5	-49.0	.00357

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -23 db and -21 db.

Test Data (cont'd) 066H
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Hamilton Kent H40 Isolator
Rated Load 40 lbs.
Test Load 40.[illegible] lbs.
November 28, 1949

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0.0	0.0
1.0	2.4
3.0	7.0
5.0	12.2
9.0	20.0
17.0	40.0
28.0	70.5
36.0	87.1
40.0	95.4
42.0	99.7
44.0	103.8
46.0	105.5

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

21.5 thousandths of an inch
15.7 after ½ minute
14.3 after 1 minute
12.3 after 2 minutes

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

068L

Lord 206 PH 45 Isolator
Rated Load 45 lbs.
Test Load 40.0 lbs.
December 2, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmissibility
2	14.5	14.9	0.3	1.03
3	20.0	22.0	1.0	1.10
4	12.1	14.8	11.8	1.22
5	12.2	16.8	2.8	1.38
6	9.3	15.3	4.3	1.65
7	5.3	16.7	10.0	3.16
8	2.4	15.8	16.5	6.60
8.5	1.2	14.8	22.0	12.4
9	0.7	20.2	29.3	28.9
9.5	3.3	18.1	14.9	5.50
10	5.0	15.6	10.0	3.12
11	7.3	11.5	4.1	1.58
12	9.4	10.0	0.7	1.07
13	7.2	5.3	-2.7	.736
14	6.6	4.8	-2.8	.730

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
15	4.00	12.0	2.20	7.0	-5.0	.550
16	3.00	9.5	1.50	3.5	-6.0	.500
17	4.30	12.5	1.75	5.5	-7.0	.407
18	5.20	14.5	2.00	6.0	-8.5	.385
19	6.40	16.0	2.10	6.5	-9.5	.329
20	7.60	17.5	2.15	6.7	-10.8	.283
25	330	50.4	40.0	32.0	-18.4	.121
30	119	41.5	10.0	20.0	-21.5	.0840
40	77.0	37.8	3.80	11.6	-26.2	.0494
50	130	42.5	4.22	12.6	-29.9	.0324
60	165	44.3	3.70	11.3	-33.0	.0224
70	179	45.0	3.16	10.0	-35.0	.0176
80	170	44.6	2.40	7.6	-37.0	.0141
90	280	49.0	2.95	9.4	-37.6	.0105
100	272	48.7	2.35	7.3	-41.4	.00864
130	292	49.2	1.50	3.5	-44.9	.00515
160	290	49.3	1.00	0.0	-49.3	.00346
200	360	51.1	.890	-1.0	-57.2	.00247

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 206 PH 45 Isolator
Rated Load 45 lbs.
Test Load 40.0 lbs.
December 2, 1949

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
250	372	51.4	.565	-5.0	-56.4	.00152
300	412	52.4	.570	-4.9	-57.3	.00138
350	430	52.7	.285	-10.9	-63.6	.000665
420	354	51.0	.250	-12.0	-63.0	.000707
500	450	53.1	.200	-14.0	-67.1	.000445
600	415	52.4	.230	-12.8	-65.2	.000555
700	765	57.7	.270	-11.3	-69.0	.000353
800	770	57.8	.425	-8.3	-66.1	.000553
1000	192	45.7	.190	-14.4	-60.1	.000790
1720	380	51.6	.380	-8.3	-59.9	.00100
2570	840	58.5	.415	-7.6	-66.1	.000495
6000	151	43.6	.570	-5.0	-48.6	.00378
6300	645	56.2	10.4	20.5	-35.7	.0161
7350	168	44.5	.210	-13.5	-58.0	.00125
9100	1.66	4.3	.620	-4.2	-8.5	.373

Static Test Data

Load in pounds	Deflection in thousandths of an inch
2	5.4
4	11.9
6	18.7
8	25.7
10	33.8
12	43.0
14	51.0
16	58.8
18	66.8
20	75.6
22	83.4
26	102.0
28	111.3
30	119.1
32	127.0

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 206 PH 45 Isolator
Rated Load 45 lbs.
Test Load 40.0 lbs.
December 2, 1949

Load in pounds	Deflection in thousandths of an inch
34	135.5
36	146.3
38	154.8
40	164.5
42	172.0
44	180.0
46	188.7
51.62	215.5
55.62	236.5

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

10.0 thousandths of an inch
4.0 after ½ minute
3.3 after 1 minute
2.4 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -22 db and -22 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1738.3
Rated Load 51.8-83 lbs.
Test Load 66.1
January 1[illegible], 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	10.5	10.1	-0.2	.961
4	9.8	10.4	0.6	1.06
6	6.3	8.8	3.0	1.40
8	6.3	9.6	3.8	1.52
9	6.8	10.4	3.8	1.53

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
10	1.00	0.0	1.80	5.4	5.4	1.80
11	1.00	0.0	2.70	8.6	8.6	2.70
12	1.00	0.0	4.90	13.8	13.8	4.90
12.5	1.00	0.0	7.10	17.0	17.0	7.10
13	1.00	0.0	8.20	18.3	18.3	8.20
13.5	1.00	0.0	8.85	18.9	18.9	8.85
14	1.00	0.0	6.80	16.7	16.7	6.80
15	1.00	0.0	3.98	12.1	12.1	3.98
16	2.00	6.0	4.40	11.9	5.9	2.20
17	2.00	6.0	3.30	10.5	4.5	1.65
18	2.00	6.0	2.43	7.8	1.8	1.21
19	2.00	6.0	2.08	6.4	0.4	1.04
20	2.00	6.0	1.69	4.5	-1.5	.845
22	2.00	6.0	1.87	5.4	-4.2	.623
25	2.00	6.0	2.17	6.7	-7.2	.434
30	10.0	20.0	2.60	8.4	-11.6	.260
35	10.0	20.0	1.79	5.0	-15.0	.179
45	10.0	20.0	1.22	1.8	-18.2	.122
50	100.	40.0	8.30	18.4	-21.6	.0830
60	100.	40.0	5.75	15.2	-24.8	.0575
70	100.	40.0	4.23	12.6	-27.4	.0423
80	100.	40.0	3.07	9.8	-29.2	.0307
90	100.	40.0	2.50	8.0	-32.0	.0250
100	100.	40.0	1.98	5.9	-34.1	.0198
130	100.	40.0	1.20	1.7	-38.3	.0120
160	200.	46.0	1.61	4.1	-41.9	.0081
200	200.	46.0	1.00	0.0	-46.0	.00500
250	278.	48.9	1.00	0.0	-48.9	.00360
350	291.	49.3	.420	-7.4	-56.7	.00144

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1738.3
Rated Load 51.8-83 lbs.
Test Load 66.1
January 18, 1950

Frequency cps***	Accelerometer Readings				db change	Transmissibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
400	278.	48.9	.400	-7.8	-56.7	.00144
500	357.	50.1	.700	-3.1	-53.2	.00187
600	425.	52.7	.500	-6.0	-58.7	.00118
700	660.	56.5	.600	-4.4	-60.9	.000909
800	800.	58.1	.430	-7.2	-65.3	.000538
900	1540.	63.7	1.00	0.0	-63.7	.000650
1000	328.	50.4	.395	-8.0	-58.4	.00120
1300	273.	48.8	.340	-9.3	-58.1	.00125
1500	273.	48.8	1.00	0.0	-48.8	.00366
1800	390.	51.8	.300	-10.4	-62.2	.000770
2330	280.	49.0	.520	-5.7	-54.7	.00185
2500	495.	53.9	.270	-11.3	-65.2	.000546
2700	2500.	68.0	1.00	0.0	-68.0	.000400
3000	600.	55.5	.320	-9.7	-65.5	.000535
4000	170.	44.5	.150	-16.5	-61.0	.000[illegible]
4170	166.	44.4	.810	-1.8	-46.2	.00488
4830	825.	58.4	.320	-9.7	-68.1	.000388
6760	1230.	62.0	.810	-1.8	-63.8	.000659
7740	176.	44.8	.860	-1.3	-46.1	.00489
8000	150.	43.5	.530	-5.5	-49.0	.00353

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -21 db and -23 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 1738.3
Rated Load 51.8-83 lbs.
Test Load 66.1
January 18, 1950

Static Test Data

Load in pounds.	Deflection in thousandths of an inch
0	0.0
5	6.5
20	27.5
40	54.5
60	82.5
80	101.0
100	109.0
120	115.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

4.8 thousandths of an inch
3.6 after ½ minute
3.3 after 1 minute
3.1 after 1½ minute
3.1 after 2 minutes

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 12 Isolator
Rated Load 60-180 lbs.
Test Load 66.1 lbs.
December 16, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmissibility
2	10.9	10.0	-0.7	.917
4	11.5	11.9	0.4	1.04
6	10.2	11.4	1.0	1.12
8	8.8	10.7	1.7	1.22
10	8.9	13.7	3.8	1.54
11	5.8	10.7	5.3	1.85

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
12	1.60	4.0	3.70	11.4	7.4	2.31
13	1.40	3.0	4.10	12.3	9.3	2.93
14	1.15	1.5	4.5C	13.0	11.5	3.91
15	1.00	0.0	7.00	17.0	17.0	7.00
16	1.50	1.5	6.80	16.5	15.0	4.53
16.5	1.00	0.0	6.00	15.7	15.7	6.00
17	1.00	0.0	5.40	14.6	14.6	5.40
18	1.00	0.0	3.50	11.0	11.0	3.50
19	1.40	3.0	3.50	11.0	8.0	2.50
20	1.75	4.8	3.35	10.6	5.8	1.91
22	2.80	8.8	3.20	10.1	1.3	1.14
24	4.00	12.0	3.16	10.0	-2.0	.775
25	4.20	12.8	3.16	10.0	-2.4	.738
26	4.76	13.6	3.31	10.5	-3.1	.696
28	3.16	10.0	1.70	4.6	-5.4	.537
30	4.60	13.3	2.03	6.2	-7.1	.441
35	5.36	14.6	1.56	3.8	-10.8	.291
40	9.80	19.8	2.00	6.0	-13.8	.205
45	10.0	20.0	1.54	3.7	-16.3	.0650
50	10.0	20.0	1.23	2.0	-18.0	.0814
60	13.3	22.6	1.16	1.4	-21.2	.0873
70	25.0	28.0	1.60	4.0	-24.0	.0640
80	42.6	32.7	2.00	6.0	-26.7	.0470
90	86.0	38.7	3.16	10.0	-28.7	.0368
100	44.5	33.0	1.30	2.4	-30.6	.0292

Test Data (cont'd) 092M
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 12 Isolator
Rated Load 60-180 lbs.
Test Load 66.1 lbs.
December 16, 1949

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
130	106	40.6	1.90	5.6	-35.0	.0179
160	115	41.4	1.40	3.0	-38.4	.0122
200	130	42.4	1.00	0.0	-42.4	.00769
250	209	46.4	1.00	0.0	-46.4	.00478
300	223	47.0	1.00	0.0	-47.0	.00448
350	242	47.7	.500	-6.0	-53.7	.00207
400	219	46.8	.435	-7.2	-54.0	.00199
500	168	44.5	.365	-8.7	-53.2	.00217
600	238	47.5	.480	-6.4	-53.9	.00206
700	221	46.9	.336	-9.4	-56.3	.00152
800	595	55.5	1.00	0.0	-55.5	.00168
900	380	51.7	1.00	0.0	-51.7	.00263
1000	140	43.0	.480	-6.3	-49.3	.00343
1500	124	42.0	1.00	0.0	-42.0	.00807
2000	105	40.5	.670	-3.4	-43.9	.00638
3250	227	47.1	.270	-11.4	-58.5	.00119
7360	96.0	39.7	1.16	1.3	-38.4	.0121

Static Test Data

Load in pounds	Deflection in thousandths of an inch
25	20.5
50	40.5
75	59.5
100	78.0
125	97.0
150	114.5
175	130.5
215	154.5

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 12 Isolator
Rated Load 60-180 lbs.
Test Load 66.1 lbs.
December 16, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

12.0 thousandths of an inch
9.0 after ½ minute
8.0 after 1 minute
7.6 after 1½ minutes
7.2 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -23 db and -29 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 712-25 Isolator
Rated Load 60-250 lbs.
Test Load 196.9 lbs.
February 7, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	6.8	9.4	2.8	1.38
2.5	5.5	8.9	4.8	1.62
3	4.5	11.0	7.9	2.44
3.2	3.2	9.3	9.3	2.91
3.5	2.0	11.1	15.0	5.55
3.8	1.2	21.3	25.0	17.8
4	1.8	18.3	20.2	10.2
4.2	3.4	17.7	14.3	5.20
4.4	5.3	14.8	9.0	2.80
4.5	3.7	10.4	9.0	2.81
4.6	7.5	15.6	6.3	2.08
5.0	5.6	8.2	3.22	1.46

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
6	1.17	1.5	1.00	0.0	-1.5	.855
7	3.10	9.9	1.00	0.0	-9.9	.323
8	2.30	7.2	1.00	0.0	-7.2	.435
9	4.00	12.1	1.00	0.0	-12.1	.250
10	5.90	15.4	1.00	0.0	-15.4	.170
15	13.8	22.8	1.00	0.0	-22.8	.0725
20	28.8	29.2	1.00	0.0	-29.2	.0347
25	43.2	32.8	1.00	0.0	-32.8	.0232
30	61.0	35.7	1.00	0.0	-35.7	.0134
40	104	40.4	1.00	0.0	-40.4	.00964
50	158	43.9	1.00	0.0	-43.9	.00634
60	72.0	37.4	.300	-10.5	-47.9	.00417
70	100	40.0	.350	-9.0	-49.0	.00350
80	86.5	38.8	.250	-12.0	-50.8	.00288
90	108	40.8	.250	-12.0	-52.8	.00231
100	140	42.9	.250	-12.0	-54.9	.00179
130	179	45.0	.250	-12.0	-57.0	.00144
180	332	50.5	.500	-6.1	-56.6	.00151
200	188	45.4	.474	-6.5	-51.9	.00252

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Barry 712-25 Isolator
Rated Load 60-250 lbs.
Test Load 196.9 lbs.
February 7, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
250	204	46.2	.470	-6.6	-52.8	.00231
333	223	46.9	.600	-4.4	-51.3	.00269
950	270	48.7	.395	-8.0	-56.7	.00146
1920	155	43.8	.670	-5.4	-49.2	.00436
3860	200	46.0	.820	-1.7	-47.7	.00410
4000	221	46.9	.800	-1.8	-48.7	.00362
4320	42.8	32.5	1.00	0.0	-32.5	.00234
4520	268	48.5	1.00	0.0	-48.5	.00373
5140	113.8	22.8	10.0	20.0	-2.8	.725
5400	59.2	34.5	10.0	20.0	-14.5	.169
6220	70.0	38.0	10.0	20.0	-18.0	.143
6440	820	58.4	128	42.3	-16.1	.156
7000	73.0	37.3	1.00	0.0	-37.3	.0137
7460	25.6	28.2	10.0	20.0	-8.2	.391
7920	6.05	15.7	10.0	20.0	4.3	1.65
8880	6.05	15.7	10.0	20.0	4.3	1.65
9200	3.40	10.6	5.25	14.5	3.9	1.54
9800	2.15	6.7	.430	-7.3	-14.0	.200
10,600	10.0	20.0	2.00	6.0	-14.0	.200
10,900	15.0	23.5	12.3	22.0	-1.5	.820
12,000	14.0	23.0	.270	-11.5	-34.5	.0193
12,500	3.50	11.0	2.40	7.5	-3.5	.685
14,250	.440	-7.0	.660	-3.5	3.5	1.50
15,100	1.15	1.4	1.39	2.9	1.5	1.21
16,500	.470	-6.5	1.50	3.5	10.0	3.20
18,200	50.0	34.0	1.60	4.0	-30.0	.0320

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
15	64.0
20	86.0
25	106
50	209

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

093B

Barry 712-25 Isolator
Rated Load 60-250 lbs.
Test Load 196.9 lbs.
February 7, 1950

Load in pounds	Deflection in thousandths of an inch
100	398
130	494
150	565
200	740
225	825
240	871
250	902

NOTE: The elastic member of this isolator is a steel spring which has no appreciable set.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -17 db and -24 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

094L

Lord 200 XPH 60 Isolator
Rated Load 60 lbs.
Test Load 66.1 lbs.
December 12, 1949

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	11.7	11.8	0.1	1.01
3	12.2	12.0	-0.2	.983
4	10.6	10.5	-0.1	.990
6	10.8	13.7	2.0	1.27
8	6.2	10.8	4.8	1.74
10	3.0	11.4	11.7	3.80
11	2.6	13.4	14.4	5.16
11.5	1.3	8.4	16.3	6.46
12	1.1	18.7	24.7	17.0
12.5	1.1	17.4	24.0	15.8
13	1.8	16.7	19.5	9.29
14	4.1	13.1	10.1	3.19

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
15	2.80	9.0	5.60	15.0	6.0	2.00
16	3.40	10.5	4.40	13.0	2.5	1.29
17	4.10	12.4	4.50	13.1	0.7	1.10
18	5.00	14.0	4.40	13.0	-0.1	.881
19	5.40	14.6	4.00	12.0	-2.6	.742
20	6.40	16.2	4.00	12.0	-4.2	.626
25	10.0	20.0	3.30	10.5	-9.5	.330
30	10.0	20.0	2.10	6.5	-13.5	.210
40	10.0	20.0	1.08	0.8	-19.2	.108
50	50.0	34.0	3.30	10.4	-23.6	.0660
60	22.4	27.0	1.00	0.0	-27.0	.0447
70	29.7	29.5	1.00	0.0	-29.5	.0337
80	40.0	32.2	1.00	0.0	-32.2	.0250
90	52.0	30.3	1.00	0.0	-30.3	.0192
100	64.5	36.2	1.00	0.0	-36.2	.0155
130	104	40.5	1.00	0.0	-40.5	.00962
160	152	43.6	1.00	0.0	-43.6	.00657
190	225	47.0	1.00	0.0	-47.0	.00445
220	300	49.5	1.00	0.0	-49.5	.00333
250	305	49.7	.800	-2.0	-51.7	.00252

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 XPH 60 Isolator
Rated Load 60 lbs.
Test Load 66.1 lbs.
December 12, 1949

Frequency cps***	Accelerometer Readings: Driver Millivolts	Driver db	Weight Millivolts	Weight db	db change	Transmis-sibility
300	350	51.0	1.00	0.0	-51.0	..00286
400	400	52.0	1.00	0.0	-52.0	.00250
500	160	44.0	.400	-8.0	-52.0	.00250
600	280	49.0	1.00	0.0	-49.0	.00357
700	340	50.6	.300	-10.5	-61.1	.000883
800	435	52.8	.210	-13.5	-66.3	.000483
900	215	46.6	.200	-14.0	-60.6	.000930
1000	125	42.0	.250	-12.0	-54.0	.00200
1500	190	45.5	1.30	2.5	-43.0	.00684
2500	500	54.0	.350	-9.0	-63.0	.000700
3000	61[illegible]	55.8	.240	-12.5	-68.3	.000394

At least 60 db drop from 3000 cps to 6000 cps, weight accelerometer in noise level.

6200	920	59.5	.400	-8.0	-67.5	.000435
7300	88.0	39.0	.350	-9.0	-48.0	.00398

Static Test Data.

Load in pounds	Deflection in thousandths of an inch
0	0
10	11.6
20	22.9
30	34.8
40	45.5
50	57.5
60	69.6
70	80.2
80	93.4
90	104.6
100	116.4

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 XPH 60 Isolator
Rated Load 60 lbs.
Test Load 66.1 lbs.
December 12, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

1.7 thousandths of an inch
0.9 after ½ minute
0.8 after 1 minute
0.7 after 1½ minutes
0.6 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -21 db and -24 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 60 Isolator
Rated Load 60 lbs.
Test Load 66.1 lbs.
December 9, 1949

Fre uency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	21.0	23.0	0.9	1.09
3	19.5	23.0	1.5	1.18
4	19.5	24.0	1.8	1.23
5	13.0	19.0	3.2	1.46
6	11.5	21.0	5.2	1.82
7	9.5	20.5	7.9	2.49

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
8	1.00	0.0	3.61	11.2	11.2	3.6
8.5	1.00	0.0	4.95	13.8	13.8	4.95
9.2	1.00	0.0	5.10	15.1	15.1	5.70
9.6	1.00	0.0	5.70	15.1	15.1	5.7[illegible]
10	1.00	0.0	6.00	15.6	15.6	[illegible]
10.5	1.00	0.0	3.95	12.0	12.0	[illegible]
11	1.00	0.0	2.72	8.7	8.7	[illegible]
11.5	1.00	0.0	2.10	6.5	6.5	2.10
12	2.00	6.0	3.34	10.5	4.5	1.67
13	5.00	14.0	5.70	15.2	1.2	1.14
14	5.00	14.0	4.45	13.0	-1.0	.890
15	10.0	20.0	6.92	16.8	-3.2	.692
17	5.00	14.0	2.18	6.6	-7.4	.426
20	10.0	20.0	2.70	8.6	-11.4	.270
25	10.0	20.0	1.63	4.4	-15.6	.163
30	40.0	32.2	4.50	13.1	-19.1	.112
40	50.0	33.9	2.95	9.4	-23.3	.0580
50	40.0	32.1	1.49	3.4	-28.7	.0372
60	50.0	33.9	1.28	2.3	-31.6	.0256
70	100	40.0	1.88	5.5	-34.5	.0188
80	100	40.0	1.40	3.0	-37.0	.0140
90	200	46.0	2.30	7.2	-38.8	.0115
100	400	52.2	3.63	11.3	-40.9	.00908
130	400	52.2	2.13	6.7	-45.5	.00532
160	298	49.5	1.00	0.0	-49.5	.00336
200	268	48.6	.500	-6.0	-54.6	.00187

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 60 Isolator
Rated Load 60 lbs.
Test Load 66.1 lbs.
December 9, 1949

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
250	406	52.3	.433	-5.2	-57.5	.00104
300	330	50.5	.530	-5.6	-56.1	.00161
400	350	50.9	.790	-2.0	-52.9	.00226
500	256	48.3	.316	-10.0	-58.3	.00123
510	272	48.7	.250	-12.0	-60.7	.000920
600	427	52.7	.300	-10.4	-63.1	.000703
700	389	51.8	.395	-8.0	-59.0	.00102
800	550	54.8	.444	-7.0	-61.8	.000807
900	260	48.4	.400	-7.8	-56.2	.00154
1000	119	41.6	.330	-9.5	-51.1	.00277
1150	166	44.4	.290	-10.7	-55.1	.00175
1570	215	46.7	.890	-1.0	-47.7	.00414
2500	780	57.9	.520	-5.7	-63.6	.000657
3220	240	47.6	.360	-8.8	-56.4	.00150
4700	560	54.9	.146	-16.7	-71.6	.000266
6600	780	57.8	.630	-4.0	-61.8	.000808
7450	159	43.9	.800	-1.8	-45.7	.00503

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	10.0
20	39.5
40	78.5
60	114.8
70	134.5
90	160.0
100	169.0

Test Data (cont'd) 095L

Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 60 Isolator
Rated Load 60 lbs.
Test Load 66.1 lbs.
December 9, 1949

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

4.0 thousandths of an inch
3.0 after ½ minute
2.8 after 1 minute
2.5 after 1½ minutes
2.3 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -25 db and -29 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 17310
Rated Load 62.5-100 lbs
Test Load 66.1 lbs
January 18, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	10.6	12.7	1.6	1.20
4	9.2	10.4	1.1	1.13
6	8.2	9.9	1.6	1.21
8	6.8	10.0	3.4	1.47

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
10	3.16	10.0	6.40	16.0	6.0	2.02
11	3.00	9.6	8.00	18.0	8.4	2.67
12	1.00	0.0	3.40	10.6	10.6	3.40
13	1.00	0.0	5.00	14.0	14.0	5.00
14	.270	-11.3	1.73	4.7	16.0	6.41
15	.500	-6.0	3.52	10.9	16.9	7.04
16	1.00	0.0	3.65	11.2	11.2	3.65
17	1.00	0.0	2.58	8.2	8.2	2.58
18	1.00	0.0	1.89	4.5	4.5	1.89
19	1.00	0.0	1.47	3.3	3.3	1.47
20	1.00	0.0	1.17	1.5	1.5	1.17
22	1.26	2.1	1.00	0.0	-2.1	.794
24	1.70	4.6	1.00	0.0	-4.6	.589
26	2.11	6.5	1.00	0.0	-6.5	.474
28	2.62	8.4	1.00	0.0	-8.4	.382
30	3.00	9.6	1.00	0.0	-9.6	.333
35	4.52	13.2	1.00	0.0	-13.2	.222
40	6.35	16.1	1.00	0.0	-16.1	.157
45	8.05	18.2	1.00	0.0	-18.2	.124
50	10.1	20.2	1.00	0.0	-20.2	.0990
60	60.0	35.6	4.00	12.1	-23.5	.0667
70	81.5	38.3	4.00	12.1	-26.2	.0491
80	53.0	34.4	2.00	6.0	-28.4	.0378
90	69.4	36.8	2.00	6.0	-30.8	.0288
100	42.8	32.7	1.00	0.0	-32.7	.0234
130	70.0	36.9	1.00	0.0	-36.9	.0143
160	114	41.3	1.00	0.0	-41.3	.00877
200	172	44.8	1.00	0.0	-44.8	.00581
250	294	49.4	1.00	0.0	-49.4	.00340
300	270	48.6	.800	-1.9	-50.5	.00296

Test Data (cont'd) 097M
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 17310
Rated Load 62.5-100 lbs.
Test Load 66.1 lbs.
January 18, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
350	318	50.1	.435	-7.1	-57.3	.00137
400	239	47.5	.400	-7.9	-55.4	.00167
450	218	46.7	1.00	0.0	-46.7	.00458
500	359	51.1	.660	-3.6	-54.7	.00184
600	399	52.1	.429	-7.3	-59.4	.00108
700	561	55.0	.500	-6.0	-61.0	.000883
800	1120	61.2	.627	-4.0	-65.2	.000560
900	1060	60.5	.800	-1.9	-62.4	.000754
1000	410	52.4	.375	-8.4	-60.8	.000915
1200	128	42.3	.294	-10.6	-52.9	.00230
1480	364	51.3	1.78	4.8	-46.5	.00489
1600	200	46.0	.650	-3.7	-49.7	.00325
2100	182	45.3	.294	-10.6	-55.9	.00161
2400	382	51.7	.790	-2.0	-53.7	.00207
3000	1090	60.9	.580	-4.7	-65.6	.000532
4410	218	46.7	.196	-14.2	-60.9	.000900
4690	570	55.2	.382	-8.3	-63.5	.000670
6240	292	49.4	.365	-8.7	-58.1	.00125
6810	490	53.8	1.43	3.2	-50.6	.00295
7780	102	40.3	.595	-4.5	-44.8	.00583

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -24 db and -24 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 17310
Rated Load 62.5-100 lbs.
Test Load 66.1 lbs.
January 18, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	7.0
25	37.8
50	73.8
75	96.5
100	109.0
125	120.9
150	129.9

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

4.3 thousandths of an inch
3.1 after $\frac{1}{2}$ minute
2.8 after 1 minute
2.7 after $1\frac{1}{2}$ minutes
2.6 after 2 minutes.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 10 Isolator
Rated Load 50-150 lbs.
Test Load 56.5 lbs.
February 14, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	Driver db	Weight Millivolts	Weight db	db change	Transmis-sibility
8	1.00	0.0	1.50	3.5	3.5	1.50
9	1.00	0.0	1.70	4.6	4.6	1.70
10	1.00	0.0	1.70	4.6	4.6	1.70
11	1.00	0.0	1.95	5.7	5.7	1.95
12	1.00	0.0	2.00	6.0	6.0	2.00
13	1.00	0.0	2.45	7.8	7.8	2.45
14	1.00	0.0	3.05	9.8	9.8	3.05
15	1.00	0.0	4.50	13.1	13.1	4.50
16	1.00	0.0	7.70	17.8	17.8	7.70
17	1.00	0.0	10.0	20.0	20.0	10.0
18	1.00	0.0	6.10	15.8	15.8	6.10
19	1.00	0.0	3.95	12.0	12.0	3.95
20	1.00	0.0	2.65	8.5	8.5	2.65
21	1.00	0.0	1.99	5.9	5.9	1.99
22	1.00	0.0	1.50	3.5	3.5	1.50
23	1.00	0.0	1.23	2.0	2.0	1.23
24	1.00	0.0	1.04	0.4	0.4	1.04
25	2.00	6.0	1.80	5.0	-1.0	.900
30	2.00	6.0	1.10	1.0	-5.0	.550
40	8.60	18.7	2.00	6.0	-12.7	.233
50	7.90	18.0	1.00	0.0	-18.0	.127
100	60.0	35.6	2.00	6.0	-29.6	.0667
150	335	50.6	5.10	14.0	-36.6	.0152
200	435	52.8	3.70	11.4	-41.4	.00850
300	360	51.3	1.50	3.5	-47.8	.00417
350	350	51.0	1.08	0.7	-50.3	.00309
400	228	47.1	.600	-4.4	-51.5	.00265
500	340	50.5	.650	-3.6	-54.1	.00191
600	400	52.3	.880	-1.3	-53.6	.00220
700	560	55.0	1.00	0.0	-55.0	.00179
800	720	57.0	1.40	3.0	-54.0	.00195
900	530	54.5	1.40	3.0	-51.5	.00264
1000	170	44.5	.430	-7.3	-51.8	.00253
1290	379	51.6	.178	-15.2	-66.8	.000470
1780	230	47.3	.375	-8.5	-55.8	.00163
1810	238	47.5	.390	-8.2	-55.7	.00164
2420	1000	60.0	.293	-10.7	-70.7	.000293

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 10 Isolator
Rated Load 50-150 lbs.
Test Load 56.5 lbs.
February 14, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
2580	2890	69.3	.900	-0.9	-70.2	.000311
2600	2700	68.8	.670	-3.5	-72.3	.000248
3100	382	51.7	.210	-13.6	-65.3	.000550
4640	774	57.8	.305	-10.3	-68.1	.000395
4800	780	57.9	.300	-10.4	-68.3	.000385
6500	1900	65.5	.260	-11.8	-77.3	.000137
7200	142	43.1	.455	-6.8	-49.9	.00320
7960	66.0	36.4	.500	-6.0	-42.4	.00757
10,900	7.70	17.7	.630	-4.0	-21.7	.0820

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -22 db and -23 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

098M

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 10 Isolator
Rated Load 50-150 lbs.
Test Load 66.[illegible] lbs.
January 19, 1950

Frequency cps*	Displacements,** of Driver	Displacements,** of Weight	Equivalent db change	Transmissibility
2	10.3	10.2	-0.2	.971
4	9.3	9.2	-0.1	.989
6	7.3	8.5	1.2	1.16
8	6.1	8.6	3.0	1.41

Frequency cps***	Accelerometer Readings: Driver Millivolts	Driver db	Weight Millivolts	Weight db	db change	Transmissibility
10	1.00	0.0	1.57	3.8	3.8	1.57
11	1.00	0.0	1.80	5.1	5.1	1.80
12	1.00	0.0	2.12	6.6	6.6	2.12
13	1.00	0.0	2.61	8.4	8.4	2.61
14	1.00	0.0	3.88	11.8	11.8	3.88
14.5	1.00	0.0	4.97	13.9	13.9	4.97
15	1.00	0.0	7.00	16.9	16.9	7.00
15.5	.555	-5.2	4.60	13.6	18.8	8.29
16	.340	-9.3	2.17	6.7	16.0	6.39
17	1.00	0.0	6.22	15.9	15.9	6.22
18	1.00	0.0	4.13	12.4	12.4	4.13
19	1.00	0.0	2.69	8.6	8.6	2.69
20	1.00	0.0	1.97	5.8	5.8	1.97
21	1.00	0.0	1.56	3.8	3.8	1.56
22	1.00	0.0	1.28	2.2	2.2	1.28
23	1.00	0.0	1.08	0.9	0.9	1.08
24	2.00	6.0	1.77	4.9	-1.1	.885
25	2.00	6.0	1.56	3.8	-2.2	.780
30	5.00	14.0	2.20	6.8	-7.2	.440
35	5.00	14.0	1.48	3.4	-10.6	.296
40	5.00	14.0	1.06	0.6	-13.4	.212
45	10.0	20.0	1.60	4.1	-15.9	.160
50	10.0	20.0	1.30	2.4	-17.6	.130
60	20.0	26.0	1.80	5.1	-20.9	.0900
70	20.0	26.0	1.32	2.5	-23.5	.0660
80	30.0	29.6	1.40	3.0	-26.6	.0460
90	30.0	29.6	1.18	1.6	-28.0	.0393

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 10 Isolator
Rated Load 50-150 lbs.
Test Load 66.1 lbs.
January 19, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
100	50.0	33.9	1.65	4.4	-29.5	.0330
130	100	40.0	1.94	5.8	-34.2	.0194
160	100	40.0	1.31	2.4	-37.6	.0131
200	200	46.0	1.62	4.2	-41.8	.00810
250	200	46.0	1.04	0.4	-45.6	.00515
300	300	49.6	1.29	2.3	-47.3	.00430
350	257	48.2	.700	-3.1	-51.3	.00272
400	162	44.2	.316	-10.0	-54.2	.00195
450	250	48.0	2.32	7.4	-40.6	.00928
500	239	47.5	.640	-3.8	-51.3	.00268
600	316	50.0	.600	-4.4	-54.4	.00190
700	686	56.8	1.00	0.0	-56.8	.00146
800	870	58.8	1.00	0.0	-58.8	.00115
900	189	45.6	.550	-8.9	-54.5	.00291
1000	188	45.5	.400	-7.9	-53.4	.00213
1000	275	48.8	.590	-4.5	-53.3	.00215
1480	36.5	31.3	1.00	0.0	-31.3	.0274
1670	129	42.4	.206	-13.7	-56.1	.00160
2350	93.5	39.5	.490	-6.2	-45.7	.00524
2610	913	49.3	1.00	0.0	-49.3	.00110
2800	1080	60.8	.292	-10.7	-71.5	.000271
2980	837	58.4	.380	-8.4	-66.8	.000454
3250	481	53.6	.300	-10.4	-64.0	.000624
6660	715	57.1	1.00	0.0	-57.1	.00140
7600	221	46.9	1.00	0.0	-46.9	.00452
7740	211	46.5	.560	-5.1	-51.6	.00266
8050	70.0	36.9	.240	-12.4	-49.3	.00343
10,900	15.1	23.6	4.60	-6.7	-30.3	.305

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -23 db and -26 db.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 10 Isolator
Rated Load 50-150 lbs.
Test Load 66.1 lbs.
January 19, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	5.5
25	25.3
50	51.5
75	76.0
100	95.9
125	113.0
150	127.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

9.5 thousandths of an inch
4.9 after ½ minute
4.3 after 1 minute
4.1 after 1½ minutes
3.9 after 2 minutes

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 10 Isolator
Rated Load 50-150 lbs.
Test Load 76.0 lbs.
February 13, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
8	3.50	11.0	5.00	14.0	3.0	1.43
9	3.16	10.0	5.00	13.9	3.9	1.59
10	3.50	11.0	5.80	15.4	4.4	1.66
11	3.50	11.0	6.30	16.0	5.0	1.80
12	4.60	13.4	10.0	20.0	6.6	2.18
13	3.50	11.0	10.0	20.0	9.0	2.86
14	2.70	8.6	10.0	20.0	11.4	3.70
14.5	1.00	0.0	4.80	13.6	13.6	4.80
15	1.00	0.0	6.10	15.9	15.9	6.10
15.5	1.00	0.0	6.70	16.5	16.5	6.70
15.75	1.00	0.0	8.40	18.5	18.5	8.40
16	1.00	0.0	8.40	18.5	18.5	8.40
16.25	1.00	0.0	6.70	16.5	16.5	6.70
17	1.00	0.0	5.60	14.9	14.9	5.60
18	1.00	0.0	3.50	11.0	11.0	3.50
19	1.00	0.0	2.50	8.0	8.0	2.50
20	1.00	0.0	1.90	5.5	5.5	1.90
21	1.00	0.0	1.49	3.4	3.4	1.49

Since this test was run to check the effect of weight size and shape at higher frequencies data was not taken from 21 cps to 200 cps.

Frequency cps***	Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
200	150	43.5	1.10	1.0	-42.5	.00735
250	220	46.9	1.00	0.0	-46.9	.00455
300	290	49.4	1.00	0.0	-49.4	.00345
350	370	51.4	.820	-1.5	-52.9	.00222
400	350	51.0	.530	-5.5	-56.5	.00212
500	400	52.3	.760	-2.3	-54.6	.00190
600	270	48.5	1.40	3.0	-45.5	.0052
700	480	53.6	1.00	0.0	-53.6	.00209
800	130	42.4	.260	-11.6	-54.0	.00200
800	1200	61.7	.200	-14.0	-75.7	.000167
900	400	52.0	.800	-2.0	-54.0	.00200
1000	160	44.0	.300	-10.4	-54.4	.00188
1500	140	43.0	.400	-8.0	-51.0	.00286
2000	141	43.0	.550	-3.3	-46.3	.00393
2500	1000	60.0	1.10	1.0	-59.0	.00110

Test Data (cont'd) 098M

Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 10 Isolator
Rated Load 50-150 lbs.
Test Load 76.0 lbs.
February 13, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
3100	440	53.0	.450	-9.0	-62.0	.00102
3500	110	41.0				
3900	150	43.5	.250	-12.0	-55.5	.00167
4600	210	46.5	.140	-17.0	-63.5	.000667
6650	900	59.4	.270	-11.4	-70.8	.000300
7800	135	42.5	.540	-6.0	-48.5	.00400

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -21 db and -24 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 XPH 75 Isolator
Rated Load 75-120 lbs.
Test Load 76.0 lbs.
March 28, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	11.0	12.4	1.2	1.13
4	8.8	9.7	0.9	1.10
6	10.9	16.2	3.6	1.49
7	6.5	10.4	4.1	1.60
8	6.5	10.0	3.8	1.54
9	4.6	10.0	6.8	2.17
10	3.6	9.7	8.7	2.69

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
11	1.00	0.0	4.10	12.3	12.3	4.10
11.5	1.00	0.0	5.35	14.5	14.5	5.35
12	.425	-7.3	3.95	12.0	19.3	9.30
12.3	Resonance-Readings unobtainable					
13.5	1.00	0.0	7.10	17.0	17.0	7.10
14	1.00	0.0	5.45	14.7	14.7	5.45
15	1.00	0.0	2.56	8.2	8.2	2.56
16	1.00	0.0	1.53	3.7	3.7	1.53
17	1.00	0.0	1.23	1.9	1.9	1.23
18	2.00	6.0	1.91	5.7	-0.3	.955
19	2.00	6.0	1.57	3.8	-2.2	.785
20	2.00	6.0	1.30	2.4	-3.6	.650
25	3.00	9.6	1.00	0.0	-9.6	.333
30	5.00	13.9	1.06	0.6	-13.3	.212
35	7.00	16.9	1.05	0.5	-16.4	.150
40	10.0	20.0	1.11	1.0	-19.0	.111
45	15.0	23.5	1.27	2.1	-21.4	.0850
50	20.0	26.0	1.34	2.7	-23.3	.0670
60	25.0	28.0	1.24	2.0	-26.0	.0496
70	30.0	29.6	1.07	0.7	-28.9	.0356
80	100	40.0	2.68	8.6	-31.4	.0268
90	100	40.0	2.11	6.5	-33.5	.0211

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 XPH 75 Isolator
Rated Load 75-120 lbs.
Test Load 76.0 lbs.
March 28, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
100	100	40.0	1.70	4.6	-35.4	.0170
125	100	40.0	1.20	1.7	-38.3	.0120
153	200	46.0	1.60	4.0	-42.0	.00800
200	221	47.0	1.05	0.5	-46.5	.00475
250	325	50.4	1.00	0.0	-50.4	.00307
275	240	47.6	.680	-3.3	-50.9	.00283
300	135	42.6	.400	-7.9	-50.5	.00296
315	195	45.8	.500	-6.1	-51.9	.00256
400	335	50.6	.500	-6.1	-56.7	.00149
450	345	50.8	.445	-7.0	-57.8	.00129
500	330	50.5	.425	-7.4	-57.9	.00129
600	405	52.2	.720	-3.0	-55.2	.00178
699	405	52.2	1.00	0.0	-52.2	.00247
750	420	52.6	.520	-5.4	-58.0	.00124
800	580	55.4	.600	-4.4	-59.8	.00103
870	840	58.5	.320	-9.9	-68.4	.000381
930	900	59.2	.280	-11.0	-70.2	.000311
990	550	54.7	.300	-10.4	-65.1	.000857
1150	71.0	37.0	.330	-9.6	-46.6	.00465
1425	445	53.0	.210	-13.0	-66.0	.000472
1600	490	53.7	.200	-14.0	-67.7	.000408
2350	160	44.0	.700	-3.1	-47.1	.00437
4700	460	53.3	.310	-10.1	-63.4	.000674
8600	12.0	21.6	.950	-0.5	-22.1	.0792
9050	6.00	15.6	3.20	10.4	-5.2	.534
11,000	1.90	5.7	9.50	19.6	13.9	5.00
12,000	10.0	20.0	1.15	1.5	-18.5	.115

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -15 db and -21 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 200 XPH 75 Isolator
Rated Load 75-120 lbs.
Test Load 76.0 lbs.
March 28, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	4.0
20	20.2
40	39.4
60	59.6
80	79.0
100	98.4
120	118.5

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

4.6 thousandths of an inch
3.4 after ½ minute
3.1 after 1 minute
2.9 after 1½ minutes
2.8 after 2 minutes.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 15 Isolator
Rated Load 75-225 lbs.
Test Load 147.6 lbs.
January 26, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	12.4	12.8	0.3	1.03
4	10.9	12.1	1.0	1.11
6	9.9	12.4	2.0	1.25
8	6.6	9.9	3.6	1.50

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
9	1.00	0.0	1.74	4.8	4.8	1.74
10	1.00	0.0	2.42	7.7	7.7	2.42
11	1.00	0.0	3.75	11.5	11.5	3.75
11.5	1.00	0.0	3.80	11.6	11.6	3.80
12	1.00	0.0	5.35	14.5	14.5	5.35
12.5	1.00	0.0	4.60	13.3	13.3	4.60
13	1.00	0.0	4.58	13.3	13.3	4.58
14	1.00	0.0	3.16	10.0	10.0	3.16
15	1.00	0.0	2.32	6.3	6.3	2.32
16	2.00	6.0	3.00	9.6	3.6	1.50
17	3.00	9.6	3.38	10.6	1.0	1.13
18	3.96	12.0	3.63	11.3	-0.7	.917
20	10.0	20.0	5.68	15.1	-4.9	.568
22	10.0	20.0	4.60	13.3	-6.7	.460
25	10.0	20.0	3.38	10.7	-9.3	.338
30	10.0	20.0	2.25	7.0	-13.0	.225
35	10.0	20.0	1.59	4.0	-16.0	.159
40	10.0	20.0	1.20	1.7	-18.3	.120
45	10.6	20.6	1.00	0.0	-20.6	.0943
50	13.4	22.7	1.00	0.0	-22.7	.0746
60	19.7	25.8	1.00	0.0	-25.8	.0507
70	27.0	28.7	1.00	0.0	-28.7	.0371
80	37.2	31.4	1.00	0.0	-31.4	.0269
90	46.2	33.4	1.00	0.0	-33.4	.0217
100	56.8	35.0	1.00	0.0	-35.0	.0176
130	100	40.0	1.00	0.0	-40.0	.0100
160	150	43.5	1.00	0.0	-43.5	.00667
200	242	47.7	1.00	0.0	-47.7	.00413
250	350	50.9	.820	-1.7	-52.6	.00234

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 15 Isolator
Rated Load 75-225 lbs.
Test Load 147.6 lbs.
January 26, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
300	350	50.9	.810	-1.8	-52.7	.00231
350	305	49.7	1.00	0.0	-49.7	.00328
400	234	47.4	.580	-4.7	-52.1	.00248
500	262	48.5	.325	-9.7	-58.2	.00124
600	282	49.1	.350	-8.9	-58.0	.00124
700	273	48.8	.298	-10.5	-59.3	.00109
800	470	53.5	.220	-13.2	-66.7	.000468
900	564	55.0	.278	-11.1	-66.1	.000476
1000	221	46.9	.355	-9.0	-55.9	.00161
1170	100	40.0	2.04	6.2	-33.8	.0204
1490	434	52.8	.292	-10.7	-63.5	.000674
1800	177	44.9	.320	-9.8	-54.7	.00181
2020	190	45.5	2.30	7.2	-38.3	.0121
2760	2880	69.2	8.20	18.3	-50.9	.00284
3000	1190	61.7	3.22	10.3	-51.4	.00271
3190	790	58.0	.500	-6.0	-64.0	.000633
4680	1000	60.0	.218	-13.2	-73.2	.000218
6430	560	54.9	1.40	3.0	-51.9	.00250
7000	1100	61.0	.270	-11.3	-72.3	.000245
7800	330	50.5	.700	-3.0	-53.5	.00212
8400	54.7	34.8	.240	-12.4	-47.2	.00439

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	2.5
40	27.5
80	63.5
120	103.9
160	148.7
200	183.7
240	203.1
280	224.0
320	242.0
340	250.3

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 15 Isolator
Rated Load 75-225 lbs.
Test Load 147.6 lbs.
January 26, 1950

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

9.5 thousandths of an inch
6.9 after ½ minute
6.6 after 1 minute
6.3 after 1½ minutes
6.2 after 2 minutes

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 15 Isolator
Rated Load 75-225 lbs.
Test Load 196.9 lbs.
February 6, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	10.2	10.5	0.3	1.03
4	8.3	10.1	1.8	1.22
6	5.4	9.1	4.6	1.68
8	4.4	9.2	6.6	2.09

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
10	1.00	0.0	4.20	12.6	12.6	4.20
10.5	1.00	0.0	5.50	14.7	14.7	5.50
11	1.00	0.0	4.40	12.9	12.9	4.40
11.5	1.00	0.0	4.00	12.2	12.2	4.00
12	1.00	0.0	3.10	9.9	9.9	3.10
13	1.00	0.0	2.05	6.3	6.3	2.05
14	1.00	0.0	1.40	3.0	3.0	1.40
15	1.00	0.0	1.05	0.5	0.5	1.05
16	2.00	6.0	1.70	4.5	-1.5	.850
17	2.00	6.0	1.40	3.0	-3.0	.700
18	2.00	6.0	1.18	1.5	-4.5	.590
19	2.00	6.0	1.00	0.0	-6.0	.500
20	3.16	10.0	1.30	2.5	-7.5	.326
25	9.00	19.0	2.00	6.0	-13.0	.222
30	13.0	22.5	2.00	6.0	-16.5	.154
35	17.9	25.5	2.05	6.3	-19.2	.115
40	25.0	28.0	2.00	6.0	-22.0	.0800
45	32.0	30.2	2.00	6.0	-24.2	.0625
50	40.0	32.0	2.00	6.0	-26.0	.0500
60	56.0	35.0	2.00	6.0	-29.0	.0358
70	76.0	37.6	2.00	6.0	-31.6	.0264
80	100	40.0	2.00	6.0	-34.0	.0200
90	98.0	39.9	1.50	3.5	-36.4	.0153
100	75.5	37.6	1.00	0.0	-37.6	.0133
130	123	41.9	1.00	0.0	-41.9	.00814
160	189	45.5	1.00	0.0	-45.5	.00529
200	353	51.0	1.00	0.0	-51.0	.00284
250	381	51.6	.510	-5.9	-57.5	.00134

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 507 C 15 Isolator
Rated Load 75-225 lbs.
Test Load 196.9 lbs.
February 6, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
300	252	48.1	.710	-3.0	-51.1	.00282
350	220	46.8	.470	-6.6	-53.4	.00214
400	309	49.9	.365	-8.7	-58.6	.00118
450	286	49.1	.280	-11.1	-60.2	.000979
500	343	50.8	.265	-11.5	-62.3	.000773
600	340	50.7	.220	-13.2	-63.9	.000647
700	455	53.2	.310	-10.2	-63.4	.000682
800	667	56.5	.246	-12.2	-68.7	.000369
1000	480	53.6	1.00	0.0	-53.6	.00208
1200	224	47.0	.252	-11.9	-58.9	.00113
1700	276	48.8	1.00	0.0	-48.8	.00362
2360	147	43.3	.520	-4.1	-47.4	.00354
2650	2220	67.0	.420	-7.4	-74.4	.000189
2920	762	57.7	1.00	0.0	-57.7	.00131
5260	31.6	30.0	1.13	1.2	-28.8	.0358
6680	580	55.3	.262	-11.6	-66.9	.000452
6860	1270	66.2	.265	-11.5	-77.7	.000208
7480	376	48.8	.610	-4.3	-53.1	.00221
9180	1.62	4.2	2.00	6.0	1.8	1.23
10,400	11.0	21.0	1.79	5.0	-16.0	.163

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -16 db and -26 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 87 Isolator
Rated Load 87 lbs.
Test Load 97.2 lbs.
April 13, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	13.0	15.0	1.3	1.15
4	8.5	12.0	2.9	1.41
5	6.5	12.0	5.4	1.85
6	6.0	11.5	5.7	1.92
7	4.0	10.0	8.0	2.50

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
9	1.00	0.0	3.35	10.5	10.5	3.35
10	1.00	0.0	6.61	16.5	16.5	6.61
10.5	1.00	0.0	10.0	20.0	20.0	10.0
11	1.00	0.0	5.95	15.5	15.5	5.95
12	1.00	0.0	2.70	8.7	8.7	2.70
13	1.00	0.0	1.70	4.6	4.6	1.70
14	1.00	0.0	1.29	2.3	2.3	1.29
15	10.0	20.0	8.50	18.6	-1.4	.850
16	5.05	14.0	3.75	11.5	-2.5	.744
17	10.0	20.0	6.30	16.0	-4.0	.630
18	10.0	20.0	5.05	14.0	-6.0	.505
19	10.0	20.0	4.45	13.0	-7.0	.445
20	10.0	20.0	3.85	11.6	-8.4	.385
21	10.0	20.0	3.25	10.4	-9.6	.325
22	10.0	20.0	2.81	9.0	-11.0	.281
23	10.0	20.0	2.50	8.0	-12.0	.250
24	10.0	20.0	2.29	7.1	-12.9	.229
25	10.0	20.0	2.00	6.0	-14.0	.200
30	10.0	20.0	1.35	2.8	-17.2	.135
35	10.0	20.0	1.11	1.0	-19.0	.111
40	100	40.0	8.40	18.5	-21.5	.0840
45	100	40.0	6.00	15.6	-24.4	.0600
50	100	40.0	4.70	13.5	-26.5	.0470
60	100	40.0	3.55	11.0	-29.0	.0355
70	100	40.0	2.45	7.8	-32.2	.0245
80	100	40.0	1.79	5.0	-35.0	.0179
90	100	40.0	1.25	2.0	-38.0	.0125

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 87 Isolator
Rated Load 87 lbs.
Test Load 97.2 lbs.
April 13, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
100	100	40.0	1.05	0.4	-39.6	.0105
125	315	50.0	2.31	7.4	-42.6	.00735
150	100	60.0	5.00	13.9	-46.1	.00500
200	345	50.9	1.00	0.0	-50.9	.00291
250	345	50.0	.630	-4.0	-54.0	.00183
300	345	50.0	.470	-4.6	-54.6	.00136
350	345	50.0	.315	-10.0	-60.0	.000916
400	345	50.0	.395	-8.0	-58.0	.00115
450	345	50.0	.225	-13.0	-63.0	.000655
490	330	50.4	.280	-11.0	-61.4	.000849
620	460	53.4	.316	-10.0	-63.4	.000685
710	490	53.8	.270	-11.4	-65.2	.000552
850	620	56.0	.420	-7.4	-63.4	.000678
925	450	53.1	.290	-10.5	-63.6	.000645
1750	445	53.0	.316	-10.0	-63.0	.000708
1900	330	50.4	2.49	7.80	-42.6	.00755
2190	395	52.0	2.00	6.0	-46.0	.00507
2900	385	51.9	1.00	0.0	-51.9	.0026
6100	250	48.0	.750	-2.5	-50.5	.00300
6900	160	44.0	.420	-7.4	-51.4	.00262
7400	135	42.6	1.70	4.6	-38.0	.0126
8190	27.0	28.6	1.41	3.0	-25.6	.0523
9100	7.40	17.6	2.20	6.9	-10.7	.298
10,000	2.49	7.9	1.79	5.0	-2.9	.720

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	7.0
25	30.0
50	60.8
75	92.0
100	122.7
125	155.6
150	171.8

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 87 Isolator
Rated Load 87 lbs.
Test Load 97.2 lbs.
April 13, 1950

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

3.1 thousandths of an inch
1.2 after ½ minute
0.9 after 1 minute
0.7 after 1½ minutes
0.6 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -14 db and -28 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508-C-18 Insulator
Rated Load 90-270 lbs.
Test Load 147.6 lbs.
January 27, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmissibility
2	10.6	10.6	0.0	1.00
4	8.8	9.1	0.3	1.03
6	9.2	9.9	0.8	1.08

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
8	1.40	3.0	1.70	5.0	2.0	1.21
10	1.50	3.5	2.80	9.0	5.5	1.87
11	1.20	1.7	2.86	9.2	7.5	2.38
12	1.00	0.0	3.05	9.7	9.7	3.05
13	1.00	0.0	4.45	13.0	13.0	4.45
14	.500	-6.1	4.40	12.9	19.0	8.80
15	.500	-6.1	3.57	11.1	17.2	7.14
16	1.00	0.0	3.76	11.5	11.5	3.76
17	1.00	0.0	2.44	7.8	7.8	2.44
18	1.00	0.0	1.69	4.5	4.5	1.69
19	1.00	0.0	1.40	3.0	3.0	1.40
20	1.00	0.0	1.12	1.1	1.1	1.12
21	2.00	6.0	1.80	5.0	-1.0	.900
22	2.00	6.0	1.55	3.8	-2.2	.775
23	2.00	6.0	1.38	2.8	-3.2	.690
25	1.00	0.0	2.00	6.0	-6.0	.500
30	5.00	13.9	1.56	3.8	-10.1	.312
35	5.00	13.9	1.05	0.5	-13.4	.210
40	10.0	20.0	1.52	3.6	-16.4	.152
45	10.0	20.0	1.18	1.5	-18.5	.118
50	20.0	26.0	1.90	5.6	-20.4	.0950
60	20.0	26.0	1.30	2.4	-23.6	.0650
70	30.0	29.6	1.40	3.0	-26.6	.0470
80	30.0	29.6	1.06	0.6	-29.0	.0353
90	35.0	30.9	1.03	0.3	-30.6	.0294
100	50.0	33.9	1.22	1.9	-32.0	.0244
130	100.0	40.0	1.27	2.2	-37.8	.0127
160	113.	41.3	1.00	0.0	-41.3	.00883
200	179.	45.0	1.00	0.0	-45.0	.00559
250	316.	50.0	1.00	0.0	-50.0	.00316
300	294.	49.4	1.00	0.0	-49.4	.00340
350	270.	48.7	1.00	0.0	-48.7	.00370
400	310.	49.9	1.00	0.0	-49.9	.00323

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508-C- 18 Insulator
Rated Load 90-270 lbs.
Test Load 147.6 lbs.
January 27, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivots	db	db change	Transmis-sibility
450	143.	43.2	.395	-8.1	-51.3	.00276
500	338.	50.6	.660	-3.6	-54.2	.00195
600	183.	45.3	.310	-10.1	-55.4	.00169
700	220.	46.9	.300	-10.4	-57.3	.00136
800	350.	50.9	.258	-11.7	-62.6	.000738
900	423.	52.6	.250	-12.0	-64.6	.000590
1100	192.	45.7	.810	-1.8	-47.5	.00422
1150	169.	44.5	2.65	8.5	-36.0	.0157
1200	154.	43.8	1.73	4.8	-39.0	.0112
1250	100.	40.0	.425	-7.3	-47.3	.00425
1800	243.	47.8	.400	-7.9	-55.7	.00165
1900	220.	46.8	1.43	3.1	-43.7	.00650
1950	319.	50.1	3.90	11.9	-38.2	.0122
2000	443.	53.0	1.61	4.1	-48.9	.00364
2030	446.	53.1	2.68	8.5	-44.6	.00601
2500	942.	59.6	1.00	0.0	-59.6	.00106
2800	920.	59.4	.300	-10.5	-69.9	.000326
4900	760.	57.5	.900	-1.0	-58.5	.00118
6500	720.	55.0	.380	-8.5	-63.5	.000528
7500	200.	46.0	1.50	3.5	-42.5	.00750
8000	210.	46.5	2.10	6.5	-40.0	.0100
13500	8.40	18.5	1.10	1.0	-17.5	.131

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -18 db and - 21 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 - C - 18 Insulator
Rated Load 90-270 lbs.
Test Load 147.6 lbs.
January 27, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch.
0	0.0
5	2.0
50	30.0
100	61.6
150	94.2
200	129.8
250	170.5
300	214.8
350	262.5
400	315.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

6.2 thousandths of an inch
4.5 after ½ minute
4.2 after 1 minute
4.1 after 1½ minutes
4.0 after 2 minutes.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 100 Isolator
Rated Load 100 lbs.
Test Load 97.2 lbs.
April 12, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmissibility
2	12.8	13.8	0.8	1.08
4	9.9	11.7	1.6	1.18
6	7.3	11.2	3.7	1.54
7	5.7	11.2	6.1	1.97
8	3.7	9.2	8.0	2.49
9	3.0	11.6	9.2	3.87

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
10	1.00	0.0	4.45	13.0	13.0	4.45
10.5	1.00	0.0	10.0	20.0	20.0	10.00
11	1.00	0.0	8.40	18.5	18.5	8.40
11.5	1.00	0.0	6.30	16.0	16.0	6.30
12	1.00	0.0	4.0	12.2	12.2	4.00
13	1.00	0.0	2.70	8.6	8.6	2.70
14	1.00	0.0	1.79	5.0	5.0	1.79
15	1.00	0.0	1.31	2.5	2.5	1.31
16	1.00	0.0	1.00	0.0	0.0	1.00
17	10.00	20.0	7.40	17.4	-2.6	.740
18	10.00	20.0	6.10	15.6	-4.4	.610
19	10.00	20.0	5.10	14.1	-5.9	.510
20	10.00	20.0	4.60	13.3	-6.7	.460
21	10.00	20.0	3.80	11.6	-8.4	.380
22	10.00	20.0	3.55	11.0	-9.0	.355
23	10.00	20.0	3.20	10.1	-9.9	.320
24	10.00	20.0	2.70	8.6	-11.4	.300
25	10.00	20.0	2.45	7.8	-12.2	.245
30	10.00	20.0	1.60	4.2	-15.8	.160
35	10.00	20.0	1.12	1.4	-18.6	.112
40	100.00	40.0	8.60	18.6	-21.4	.0860
45	100.00	40.0	7.10	17.0	-23.0	.0710
50	100.00	40.0	5.60	14.9	-25.1	.0560
55	100.00	40.0	4.40	12.9	-27.1	.0440
60	100.00	40.0	3.80	11.6	-28.4	.0380
65	100.00	40.0	3.16	10.0	-30.0	.0316
70	100.00	40.0	2.85	9.0	-31.0	.0285
75	100.00	40.0	1.80	5.1	-34.9	.0180
80	100.00	40.0	2.09	6.4	-33.6	.0209
90	100.00	40.0	1.45	3.4	-36.6	.0145

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 100 Isolator
Rated Load 100 lbs.
Test Load 97.2 lbs.
April 12, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
100	100.0	40.0	1.20	1.8	-38.2	.0120
125	316.0	50.0	2.60	8.4	-41.6	.00825
150	316.0	50.0	2.10	6.5	-43.5	.00666
200	316.0	50.0	1.05	0.5	-49.5	.00333
250	316.0	50.0	.730	-2.6	-52.6	.00231
300	316.0	50.0	.520	-5.7	-55.7	.00165
350	316.0	50.0	.395	-8.0	-58.0	.00125
400	316.0	50.0	.300	-10.4	-60.4	.000950
450	316.0	50.0	.250	-12.0	-62.0	.000794
500	316.0	50.0	.210	-13.6	-63.6	.000666
600	316.0	50.0	.240	-12.4	-62.4	.000760
700	316.0	50.0	.245	-12.3	-62.3	.000779
800	810.0	58.1	.450	-6.9	-65.0	.000555
900	1000.0	60.0	1.00	0.0	-60.0	.00100
1000	316.0	50.0	.340	-9.3	-59.3	.00108
1175	170.0	44.6	.250	-12.0	-56.6	.00147
1600	316.0	50.0	.620	-4.3	-54.3	.00196
2000	415.0	52.5	.400	-7.9	-60.4	.000965
2300	320.0	50.4	.560	-5.1	-55.5	.00175
2620	730.0	57.3	1.00	0.0	-57.3	.00139
2920	410.0	52.4	1.60	4.0	-48.4	.00390
6350	920.0	59.1	.281	-11.0	-70.1	.000306
6500	2210.0	67.0	.600	-4.4	-71.4	.000272
6900	230.0	47.3	1.00	0.0	-47.3	.00435
7350	149.0	43.4	1.59	4.0	-47.4	.00107
7500	169.0	44.5	2.00	6.0	-38.5	.0108
9700	1.69	4.5	.420	5.4	-9.9	.248

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

1.6 thousandths of an inch
0.7 after ½ minute
0.5 after 1 minute
0.4 after 1½ minutes
0.4 after 2 minutes.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 204 PH 100 Isolator
Rated Load 100 lbs.
Test Load 97.2 lbs.
April 12, 1950

Static Test Data

Load in pounds.	Deflection in thousandths of an inch.
0	0.0
5	5.0
25	27.2
50	52.0
75	79.8
100	108.6
125	136.0
150	154.1

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively - 16 db and -26 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 C 22 Isolator
Rated Load 110-330 lbs.
Test Load 147.6 lbs.
January 24, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	11.0	11.0	0.0	1.00
4	10.0	10.9	0.8	1.09

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
6	1.00	0.0	1.19	1.6	1.6	1.19
8	1.00	0.0	1.32	2.5	2.5	1.32
10	1.00	0.0	1.47	3.3	3.3	1.47
11	1.00	0.0	2.31	6.3	6.3	2.31
12	1.00	0.0	2.67	8.6	8.6	2.67
13	1.00	0.0	3.28	10.4	10.4	3.28
14	1.00	0.0	5.10	14.1	14.1	5.10
14.5	1.00	0.0	6.30	16.0	16.0	6.30
15	1.00	0.0	5.66	14.2	14.2	5.66
15.5	1.00	0.0	5.65	15.0	15.0	5.65
16	1.00	0.0	5.60	14.9	14.9	5.60
17	1.00	0.0	3.60	11.3	11.3	3.60
18	1.00	0.0	2.50	8.0	8.0	2.50
19	1.00	0.0	1.89	5.6	5.6	1.89
20	1.00	0.0	1.44	3.2	3.2	1.44
21	1.00	0.0	1.13	1.3	1.3	1.13
22	2.00	6.0	1.90	5.6	-0.4	.950
23	2.00	6.0	1.62	4.2	-1.8	.810
24	2.00	6.0	1.38	2.8	-3.2	.690
25	2.00	6.0	1.23	1.9	-4.1	.615
27	3.00	9.6	1.47	3.3	-6.3	.490
30	3.00	9.6	1.12	1.1	-8.5	.375
35	5.00	13.9	1.27	2.1	-11.8	.254
40	10.0	20.0	1.38	2.8	-17.2	.138
50	10.0	20.0	1.10	1.0	-19.0	.110
60	20.0	26.0	1.55	3.8	-22.2	.0775
70	20.0	26.0	1.08	0.8	-25.2	.0540
80	30.0	29.6	1.20	1.7	-27.9	.0400
90	50.0	33.9	1.59	4.0	-29.9	.0318

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 £ 22 Isolator
Rated Load 110-330 lbs.
Test Load 147.6 lbs.
January 24, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	Driver db	Weight Millivolts	Weight db	db change	Transmissibility
100	63.0	36.0	1.57	3.9	-32.1	.0249
130	71.0	37.0	1.08	0.8	-36.2	.0152
160	200	46.0	1.91	5.7	-40.3	.00950
200	200	46.0	1.19	1.6	-44.4	.00595
250	149	43.4	.500	-6.1	-49.5	.00335
300	139	42.8	.500	-6.1	-48.9	.00359
350	232	47.4	.700	-3.1	-50.5	.00302
400	151	43.6	.400	-7.9	-51.5	.00265
450	240	47.6	.500	-6.1	-53.7	.00208
500	368	51.3	.500	-6.1	-57.4	.00136
600	278	48.9	.300	-10.4	-59.3	.00108
900	753	57.6	.250	-12.0	-69.6	.000332
1000	505	54.0	.415	-7.5	-61.5	.000822
1100	189	45.5	.740	-2.6	-48.1	.00391
1200	150	43.5	2.19	6.8	-36.7	.0146
1500	63.4	36.1	.240	-12.4	-48.5	.00379
1800	351	51.0	.330	-9.5	-60.5	.000940
2000	273	48.7	.810	-1.8	-50.5	.00297
2700	1000	60.0	2.50	8.0	-52.0	.00250
3050	1120	61.2	.360	-8.8	-70.0	.000321
5410	93.0	39.5	.202	-11.8	-51.3	.00217
6410	488	53.7	.900	-0.9	-54.6	.00184
6920	1240	62.0	.568	-5.0	-67.0	.000458
7100	1100	61.0	.455	-6.8	-67.8	.000413
7480	505	54.0	1.12	1.1	-52.9	.00222
7900	167	44.4	.875	-1.2	-45.6	.00524
8140	39.0	31.9	.880	-1.1	-33.0	.0225
11,000	18.8	25.5	3.66	11.3	-14.2	.1945

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 Ø 22 Isolator
Rated Load 110-330 lbs.
Test Load 147.6 lbs.
January 24, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0
5	1.0
50	19.6
100	42.8
150	67.0
200	94.8
250	123.6
300	157.8
350	193.4
400	230.0
450	265.0
500	307.7

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

2.0 thousandths of an inch
0.5 after 1 minute
0.1 after 1½ minutes
0.0 after 2 minutes

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -22 db and -26 db.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Bushings 3100 Isolator
Rated Load 100 lbs.
Test Load 97 lbs.
April 25, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	11.9	11.2	-0.5	.942
4	11.1	11.3	0.2	1.02
6	10.6	10.8	0.2	1.02
8	10.7	11.4	0.7	1.07
10	9.4	10.8	1.3	1.15

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
12	1.00	0.0	1.29	2.3	2.3	1.29
14	1.00	0.0	1.35	2.6	2.6	1.35
16	1.00	0.0	1.59	4.0	4.0	1.59
18	1.00	0.0	1.79	5.0	5.0	1.79
20	1.00	0.0	1.69	4.5	4.5	1.69
21	1.00	0.0	2.69	8.5	8.5	2.69
22	1.00	0.0	2.88	9.5	9.5	2.88
23	1.00	0.0	3.35	10.6	10.6	3.35
24	1.00	0.0	4.10	12.4	12.4	4.10
25	.680	-3.3	3.55	11.0	14.3	5.22
26	.475	-6.5	2.90	9.3	15.8	6.11
27	.355	-9.0	2.41	7.7	16.7	6.79
27.5	.250	-12.0	1.90	5.6	17.6	7.60
28	.295	-10.5	2.05	6.4	16.9	6.96
29	.520	-5.6	2.90	9.4	15.0	5.58
30	1.00	0.0	4.35	12.9	12.9	4.35
35	1.00	0.0	1.79	5.0	5.0	1.79
40	1.00	0.0	1.05	0.5	0.5	1.05
45	10.0	20.0	6.20	15.9	-4.1	.620
50	10.0	20.0	4.55	13.2	-6.8	.455
55	10.0	20.0	3.55	11.0	-9.0	.355
60	10.0	20.0	2.89	9.3	-10.7	.289
65	10.0	20.0	2.39	7.5	-12.5	.239
70	10.0	20.0	2.00	6.0	-14.0	.200
80	10.0	20.0	1.50	3.5	-16.5	.150
90	10.0	20.0	1.11	1.0	-19.0	.111
100	28.0	29.0	2.79	8.9	-20.1	.0997
125	100	40.0	5.81	15.4	-24.6	.0581
150	100	40.0	3.95	12.0	-28.0	.0395
175	100	40.0	3.05	9.8	-30.2	.0305
200	100	40.0	2.31	7.4	-32.6	.0231

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Bushings 3100 Isolator
Rated Load 100 lbs.
Test Load 97 lbs.
April 25, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
250	100	40.0	1.51	3.6	-36.4	.0151
300	100	40.0	1.05	0.5	-39.5	.0105
350	250	48.0	2.00	6.0	-42.0	.00800
400	250	48.0	1.59	4.0	-44.0	.00636
450	250	48.0	1.30	2.4	-45.6	.00520
500	250	48.0	1.11	1.0	-47.0	.00444
550	270	48.6	1.00	0.0	-48.6	.00371
600	250	48.0	.640	-1.5	-49.5	.00336
650	250	48.0	.680	-3.4	-51.4	.00272
700	250	48.0	.250	-12.0	-60.0	.00100
750	250	48.0	.455	-6.8	-54.8	.00114
800	250	48.0	.420	-7.4	-55.4	.00168
850	250	48.0	.440	-7.1	-55.1	.00176
900	250	48.0	.316	-10.0	-58.0	.00126
950	250	48.0	.330	-9.6	-57.6	.00132
1000	250	48.0	.230	-12.8	-60.8	.000920
1200	250	48.0	.460	-6.6	-54.6	.00184
1600	420	52.5	.316	-10.0	-62.5	.000753
1840	420	52.5	.281	-11.0	-63.5	.000669
2000	331	50.5	.270	-11.4	-61.9	.000816
2350	400	52.1	.700	-3.1	-55.2	.00175
2950	502	54.0	.210	-13.5	-67.5	.000419
4600	520	54.4	.316	-10.0	-64.4	.000608
6100	265	48.5	.225	-13.0	-61.5	.000849
6300	420	52.6	.475	-6.5	-59.1	.00113
6800	650	56.4	.316	-10.0	-66.4	.000487
7600	244	47.8	.890	-1.1	-58.9	.000365
7760	278	48.9	.595	-4.5	-53.4	.00214
10,600	53.0	34.4	2.04	6.2	-40.6	.00385

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -24 db and -26 db.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Bushings 3100 Isolator
Rated Load 100 lbs.
Test Load 97 lbs.
April 25, 1950

Static Test Data

Load in pounds.	Deflection in thousandths of an inch
0	0
5	1.5
25	7.0
50	15.0
75	24.4
100	33.7
125	43.4
150	53.7

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

6.5 thousandths of an inch

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract [redacted]onr-32904

Lord 281 PH 120 Isolator
Rated Load 120 lbs.
Test Load 97.2 lbs.
April 18, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	14.1	13.5	-0.3	.956
4	12.4	12.7	0.2	1.02
6	8.4	10.9	2.3	1.30

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
7	1.00	0.0	1.34	2.7	2.7	1.34
8	1.00	0.0	1.48	3.4	3.4	1.48
9	1.00	0.0	1.93	5.7	5.7	1.93
10	1.00	0.0	2.94	9.4	9.4	2.94
10.5	1.00	0.0	4.53	13.2	13.2	4.53
11	1.00	0.0	5.90	15.4	15.4	5.90
1 .5	1.00	0.0	5.70	15.1	15.1	5.70
12	1.00	0.0	5.05	14.0	14.0	5.05
13	1.00	0.0	3.37	10.6	10.6	3.37
14	1.00	0.0	2.39	7.6	7.6	2.39
15	1.00	0.0	1.74	4.8	4.8	1.74
16	1.00	0.0	1.32	2.5	2.5	1.32
17	1.00	0.0	.980	-0.1	-0.1	.980
18	2.00	6.0	1.59	4.0	-2.0	.795
19	2.00	6.0	1.34	2.6	-3.4	.670
20	2.00	6.0	1.12	1.1	-4.9	.560
22	2.50	8.0	1.07	0.7	-7.3	.428
25	4.00	12.1	1.21	1.8	-10.3	.303
30	6.00	15.6	1.16	1.4	-14.2	.193
35	10.0	20.0	1.38	2.9	-17.1	.138
40	10.0	20.0	1.02	0.2	-19.8	.102
45	20.0	26.0	1.66	4.4	-21.6	.0830
50	20.0	26.0	1.32	2.5	-23.5	.0660
60	25.0	28.0	1.19	1.6	-26.4	.0476
70	30.0	29.6	1.00	0.0	-29.6	.0333
80	40.0	32.1	1.00	0.0	-32.1	.0250
90	40.0	32.1	.760	-2.3	-34.4	.0190
100	52.0	34.3	.830	-1.6	-35.9	.0159
130	100	40.0	1.05	0.5	-39.5	.0105

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 281 PH 120 Isolator
Rated Load 120 lbs.
Test Load 97.2 lbs.
April 18, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
160	200	46.0	1.03	0.3	-45.7	.00515
200	300	49.6	1.07	0.7	-48.9	.00357
250	300	49.6	.835	-1.4	-51.0	.00278
300	283	49.1	.560	-5.1	-54.2	.00198
350	300	49.6	.510	-5.9	-55.5	.00170
400	290	49.2	.392	-8.1	-57.3	.00135
450	300	49.6	.355	-9.0	-58.6	.00118
505	219	46.8	.417	-7.5	-54.3	.00190
600	269	48.6	.272	-11.3	-59.9	.00101
700	217	46.7	.250	-12.0	-58.7	.00115
800	140	43.0	.250	-12.0	-55.0	.00178
1890	306	49.8	.316	-10.0	-59.8	.00103
2120	306	49.8	1.00	0.0	-49.8	.00327
2190	315	50.0	1.00	0.0	-50.0	.00308
2290	324	50.4	.272	-11.3	-61.6	.000750
2550	1710	64.9	.900	-0.9	-65.8	.000525
2800	630	56.0	.281	-11.0	-67.0	.000447
6800	100	40.0	.600	-4.4	-44.4	.00600
7000	100	40.0	.700	-3.1	-43.1	.00700
7200	84.0	38.5	3.55	11.0	-27.5	.0423
7550	70.0	36.9	.630	-4.0	-40.9	.000900
8200	15.1	23.6	.460	-6.7	-30.3	.0304
8750	5.50	14.8	.332	-0.5	-24.3	.0605
9050	2.15	6.6	1.11	1.0	-5.6	.515
9600	2.20	6.9	1.00	0.0	-6.9	.455
10,600	20.2	26.1	.675	-3.4	-29.5	.0335
10,990	8.50	18.6	3.95	12.0	-6.6	.465
11,300	15.0	23.5	1.05	0.5	-23.0	.0700
11,800	54.0	34.6	3.00	9.6	-25.0	.0556
12,000	13.5	22.6	6.80	16.6	-8.0	.504
13,000	4.40	12.9	5.40	14.6	1.7	1.23
17,400	6.80	16.6	3.55	11.0	-5.6	.523

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 281 PH 120 Isolator
Rated Load 120 lbs.
Test Load 97.2 lbs.
April 18, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	3.0
25	20.0
50	45.0
75	77.0
100	107.0
150	167.5
200	194.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

6.0 thousandths of an inch
3.0 after $\frac{1}{2}$ minute
2.2 after 1 minute
2.0 after $1\frac{1}{2}$ minutes
1.8 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -13 db and -28 db.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 283 PH 120 Isolator
Rated Load 120 lbs.
Test Load 97.2 lbs.
April 18, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	11.4	11.4	0.0	1.00
4	9.4	12.3	2.3	1.31
6	6.1	11.1	5.1	1.82
7	3.8	9.9	8.4	2.61

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
8	1.00	0.0	5.62	15.0	15.0	5.62
8.5	1.00	0.0	7.10	17.0	17.0	7.10
9	1.00	0.0	6.00	15.6	15.6	6.00
9.5	1.00	0.0	4.45	13.0	13.0	4.45
11	1.00	0.0	1.59	4.0	4.0	1.59
12	1.00	0.0	1.20	1.6	1.6	1.20
12.5	1.00	0.0	1.00	0.0	0.0	1.00
13	10.0	20.0	8.40	18.5	-1.5	.840
14	10.0	20.0	7.00	16.9	-3.1	.700
15	10.0	20.0	5.00	13.9	-6.1	.500
16	10.0	20.0	4.45	12.9	-7.1	.445
17	10.0	20.0	3.60	11.2	-8.8	.360
18	10.0	20.0	3.20	10.2	-9.8	.320
19	10.0	20.0	2.71	8.7	-11.3	.271
20	10.0	20.0	2.50	8.0	-12.0	.250
22	10.0	20.0	1.99	5.9	-14.1	.199
24	10.0	20.0	1.69	4.5	-15.5	.169
26	10.0	20.0	1.39	2.9	-17.1	.139
28	10.0	20.0	1.12	1.2	-18.8	.112
30	10.0	20.0	1.00	0.0	-20.0	.100
35	100	40.0	7.20	17.2	-22.8	.0720
40	100	40.0	5.59	14.9	-25.1	.0559
45	100	40.0	4.60	13.2	-26.8	.0460
50	100	40.0	3.95	12.0	-28.0	.0395
55	100	40.0	3.15	10.0	-30.0	.0315
60	100	40.0	2.90	9.3	-30.7	.0290
66	100	40.0	2.20	6.8	-33.2	.0220
70	100	40.0	2.01	6.1	-33.9	.0201
74	100	40.0	1.68	4.4	-35.6	.0168
80	100	40.0	1.42	3.2	-36.8	.0142

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 283 PH 120 Isolator
Rated Load 120 lbs.
Test Load 97.2 lbs.
April 18, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	Driver db	Weight Millivolts	Weight db	db change	Transmis-sibility
84	100	40.0	1.21	2.0	-38.0	.0121
92	100	40.0	1.05	0.5	-39.5	.0105
105	1000	60.0	8.80	18.9	-41.1	.00880
125	315	50.0	2.20	6.9	-43.1	.00699
150	315	50.0	1.11	1.0	-49.0	.00352
200	315	50.0	.670	-3.4	-53.4	.00212
255	270	48.6	.395	-8.0	-56.6	.00146
310	285	49.1	.300	-10.4	-59.5	.00105
350	285	49.1	.300	-10.4	-59.5	.00105
405	360	51.1	.360	-8.9	-60.0	.00100
519	329	50.4	.285	-10.9	-61.3	.000866
550	340	50.6	.800	-12.0	-62.6	.000236
600	400	52.1	.800	-12.0	-64.1	.000200
670	480	53.6	.315	-10.0	-63.6	.000657
735	325	50.4	.250	-12.0	-62.4	.000769
841	420	52.6	.600	-4.4	-57.0	.00143
910	150	43.5	.280	-11.0	-54.5	.00187
950	150	43.5	.229	-12.9	-56.4	.00153
980	126	42.1	.200	-14.0	-56.1	.00159
2000	505	54.0	.340	-10.6	-64.6	.000673
2222	1210	62.0	3.15	10.0	-52.0	.00260
2500	1700	64.6	1.41	3.0	-61.6	.000830
2750	1600	64.1	1.25	2.0	-66.1	.000780
2900	1390	62.9	.415	-12.0	-74.9	.000298
3050	561	55.0	.420	-7.4	-62.4	.000748
5200	74.0	37.4	.315	-1.0	-47.4	.00426
6800	275	48.9	.450	-6.9	-55.8	.00164
7600	230	47.1	2.80	8.9	-38.2	.0122
8200	13.0	22.4	.561	-5.0	-17.4	.431
10,000	5.4	14.6	4.45	13.0	-1.6	.825

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 283 PH 120 Isolator
Rated Load 120 lbs.
Test Load 97.2 lbs.
April 18, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	7.0
25	35.0
50	71.9
75	111.0
100	152.9
150	242.5
200	283.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

7.0 thousandths of an inch
3.2 after $\frac{1}{2}$ minute
2.6 after 1 minute
2.2 after $1\frac{1}{2}$ minutes
2.0 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -17 db and -26 db.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 279 PH 120 Isolator
Rated Load 120 lbs.
Test Load 97.2 lbs.
April 17, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	10.4	10.5	0.1	1.01
4	9.4	10.2	0.9	1.09

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
7	1.00	0.0	1.35	2.9	2.9	1.35
8	1.00	0.0	1.49	3.4	3.4	1.49
9	1.00	0.0	1.79	5.0	5.0	1.79
10	1.00	0.0	2.50	8.0	8.0	2.50
11	1.00	0.0	4.15	12.5	12.5	4.15
12	1.00	0.0	5.60	14.9	14.9	5.60
13	1.00	0.0	4.20	12.6	12.6	4.20
14	1.00	0.0	3.70	11.4	11.4	3.20
15	1.00	0.0	2.45	7.9	7.9	2.45
16	1.00	0.0	1.89	5.4	5.4	1.89
17	1.00	0.0	1.31	2.5	2.5	1.31
18	1.00	0.0	1.00	0.0	0.0	1.00
19	10.0	20.0	7.90	18.0	-2.0	.790
20	10.0	20.0	6.60	16.4	-3.6	.660
21	10.0	20.0	5.61	15.0	-5.0	.561
22	10.0	20.0	5.00	13.9	-6.1	.500
23	10.0	20.0	4.35	12.9	-7.1	.435
24	10.0	20.0	3.79	11.6	-8.4	.379
25	10.0	20.0	3.55	11.0	-9.0	.355
30	10.0	20.0	2.20	6.9	-13.1	.220
35	10.0	20.0	1.55	3.8	-16.2	.155
40	10.0	20.0	1.15	1.4	-18.6	.115
45	10.0	20.0	1.00	0.0	-20.0	.100
50	100	40.0	7.10	17.0	-23.0	.0710
55	100	40.0	6.00	15.6	-24.4	.0600
60	100	40.0	5.30	14.5	-25.5	.0530
65	100	40.0	4.40	12.6	-27.4	.0440
70	100	40.0	3.75	11.5	-28.5	.0375
80	100	40.0	2.75	8.8	-31.2	.0275
85	41.5	32.4	1.00	0.0	-32.4	.0241
95	100	40.0	1.94	5.8	-34.2	.0194

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 279 PH 120 Isolator
Rated Load 120 lbs.
Test Load 97.21 lbs.
April 17, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
110	100	40.0	1.47	3.3	-36.7	.0147
130	100	40.0	1.02	0.2	-39.8	.0102
160	200	46.0	1.42	3.1	-42.9	.0071
200	250	48.0	1.13	1.2	-46.8	.00452
250	353	51.0	1.00	0.0	-51.0	.00283
300	316	50.0	.710	-3.0	-53.0	.00225
350	296	49.5	.500	-6.1	-55.6	.00169
400	250	48.0	.320	-9.8	-57.8	.00128
450	161	44.1	.200	-14.0	-48.1	.00124
510	250	48.0	.650	-3.7	-51.7	.00260
520	255	48.2	.500	-6.1	-54.3	.00196
600	300	49.6	.245	-8.2	-57.8	.00148
680	422	52.6	.316	-10.0	-62.6	.000750
750	538	54.6	.400	-7.9	-62.5	.000744
800	558	54.9	.500	-6.1	-61.0	.000895
900	170	44.6	.184	-14.7	-59.3	.00108
2000	740	57.4	.300	-10.4	-47.0	.00406
2170	462	53.3	1.00	0.0	-53.3	.00217
2620	725	57.2	1.00	0.0	-57.2	.00138
2900	365	51.0	1.00	0.0	-51.0	.00274
7000	133	42.6	2.50	8.0	-34.6	.0188
7500	220	46.8	6.00	15.6	-31.2	.0272
8200	17.0	24.6	.561	-5.0	-29.6	.0330
9000	4.50	13.1	.561	-5.0	-18.1	.125
9850	5.80	15.4	6.60	16.4	1.0	1.140

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	4.3
25	21.8
50	41.8
75	62.3
100	83.4
150	127.5
200	149.3

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Lord 279 PH 120 Isolator
Rated Load 120 lbs.
Test Load 97.2 lbs.
April 17, 1950

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

3.0 thousandths of an inch
1.6 after $\frac{1}{2}$ minute
1.3 after 1 minute
1.1 after $1\frac{1}{2}$ minutes
0.9 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -13.4 db and -28 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 C 26 Isolator
Rated Load 130-390 lbs.
Test Load 147.6 lbs.
January 30, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
6	3.00	9.5	2.30	7.2	-2.3	.767
7	2.50	8.0	2.30	7.2	-0.8	.920
8	2.20	6.8	2.00	6.0	-0.8	.909
9	3.00	9.5	3.16	10.0	5.0	1.05
10	2.70	8.5	3.00	9.5	1.0	1.11
11	2.45	7.7	3.00	9.5	1.8	1.23
12	2.20	6.8	3.00	9.5	2.7	1.36
13	1.95	5.8	3.00	9.5	3.7	1.54
14	1.95	5.8	3.00	9.5	3.7	1.54
15	1.75	4.8	3.00	9.5	4.7	1.71
16	1.50	3.5	3.00	9.5	6.0	2.00
17	1.20	1.5	3.00	9.5	8.0	2.50
18	1.30	2.4	4.00	12.0	9.6	3.09
19	1.00	0.0	4.20	12.5	12.5	4.20
20	.600	-4.5	3.80	11.5	16.0	6.33
21	.420	-7.5	3.60	11.2	18.7	8.58
22	.500	-6.0	3.50	11.0	17.0	7.00
23	.720	-3.0	3.35	10.5	13.5	4.66
24	1.00	0.0	3.20	10.3	10.3	3.20
25	1.20	1.7	3.10	9.9	8.2	2.58
26	1.20	1.7	2.40	7.6	5.9	2.00
27	1.50	3.5	2.45	7.7	4.2	1.63
28	1.80	5.0	2.50	8.0	3.0	1.39
29	2.10	6.5	2.50	8.0	1.5	1.19
30	2.95	9.4	3.00	9.5	0.1	1.02
31	1.42	3.1	1.34	2.6	-0.5	.944
32	2.80	9.0	2.30	7.3	-1.7	.821
33	3.16	10.0	2.31	7.4	-2.6	.731
34	4.00	12.0	2.60	8.4	-3.6	.650
35	4.50	13.0	2.65	8.5	-4.5	.589
40	10.0	20.0	4.20	12.5	-7.5	.420
50	20.0	26.0	5.90	15.4	-10.6	.295
60	33.0	30.5	4.90	13.8	-16.7	.140
70	44.0	33.0	4.80	13.6	-19.4	.109
80	140	43.0	10.0	20.0	-23.0	.0715
90	16.0	24.0	1.10	1.0	-23.0	.0690

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 C 26 Isolator
Rated Load 130-390 lbs.
Test Load 147.6 lbs.
January 30, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
100	19.0	25.5	1.00	0.0	-25.5	.0525
130	33.0	30.5	1.00	0.0	-30.5	.0303
160	280	49.0	5.10	14.4	-34.6	.0182
200	85.0	38.5	1.00	0.0	-38.5	.0118
250	130	42.5	1.00	0.0	-42.5	.00770
300	170	44.6	1.00	0.0	-44.6	.00590
350	180	45.0	1.01	0.4	-44.6	.00560
400	240	47.6	1.00	0.0	-47.6	.00417
450	290	49.4	1.00	0.0	-49.4	.00345
500	390	51.9	1.00	0.0	-51.9	.00256
600	310	49.9	.600	-4.5	-54.4	.00194
700	430	52.8	.520	-5.4	-58.6	.00121
760	670	56.6	NL			
900	1000	60.0	NL			
1000	490	53.8	.610	-4.2	-58.0	.00124
1100	150	43.5	.810	-1.8	-45.3	.00540
1700	128	42.3	1.00	0.0	-42.3	.00780
1800	112	41.2	1.00	0.0	-41.2	.00893
1900	88.0	38.8	1.00	0.0	-38.8	.0114
2000	65.0	36.3	1.00	0.0	-36.3	.0154
2050	143	43.2	1.00	0.0	-43.2	.00699
2650	1270	62.2	1.00	0.0	-62.2	.000787
6440	890	59.0	1.59	3.8	-55.2	.00179
6700	2500	68.0	1.30	2.4	-65.6	.000520
7500	206	46.2	1.72	4.7	-41.5	.00835
8000	100	40.0	.375	-8.5	-48.5	.00375
11,000	160	44.0	.700	-3.0	-47.0	.00440
13,900	20.0	26.0	1.80	5.0	-21.0	.0900
17,500	9.00	18.0	.600	-4.5	-22.5	.0665
23,000	9.60	19.6	4.60	33.5	-13.9	.048

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -26 db and -26 db.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 C 26 Isolator
Rated Load 130-390 lbs.
Test Load 147.6 lbs.
January 30, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0
5	1.5
100	29.1
200	62.9
300	100.6
400	147.3
500	196.6
600	253.0

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

10.0 thousandths of an inch
7.0 after ½ minute
6.9 after 1 minute
6.5 after 1½ minutes
6.0 after 2 minutes.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Hamilton Kent 150 Isolator
Rated Load 150 lbs.
Test Load 147.6 lbs.
January 31, 1950

Frequency cps*	Displacements,** of Driver	Displacements,** of Weight	Equivalent db change	Transmissibility
2	11.4	11.2	-0.2	.970
4	10.0	10.0	0.0	1.00
5.2	9.6	10.0	0.4	1.04
6.4	9.5	10.0	0.5	1.05
7	9.3	9.8	0.5	1.05

Frequency cps***	Accelerometer Readings: Driver Millivolts	Driver db	Weight Millivolts	Weight db	db change	Transmissibility
8	2.20	6.9	2.50	8.0	1.1	1.14
12	1.39	2.6	2.00	6.0	4.0	1.44
14	1.00	0.0	2.00	6.0	6.0	2.00
15	1.00	0.0	2.25	7.0	7.0	2.25
16	1.00	0.0	3.00	9.6	9.6	3.00
17	1.00	0.0	4.00	12.1	12.1	4.00
18	1.00	0.0	4.90	13.8	13.8	4.90
18.5	1.00	0.0	5.00	14.0	14.0	5.00
19	1.00	0.0	5.05	14.0	14.0	5.05
19.5	1.00	0.0	4.80	13.6	13.6	4.80
20	1.00	0.0	4.20	12.6	12.6	4.20
21	1.00	0.0	3.72	11.4	11.4	3.72
22	1.00	0.0	2.90	9.3	9.3	2.90
23	1.00	0.0	2.30	7.2	7.2	2.30
24	1.00	0.0	1.98	5.9	5.9	1.98
25	1.00	0.0	1.71	4.6	4.6	1.71
26	1.00	0.0	1.42	3.1	3.1	1.42
27	1.00	0.0	1.21	1.7	1.7	1.21
28	2.00	6.0	2.06	6.3	0.3	1.03
29	2.00	6.0	1.84	5.3	-0.7	.920
30	2.00	6.0	1.63	4.2	-1.8	.815
32	2.00	6.0	1.36	2.7	-3.3	.680
34	2.00	6.0	1.12	1.1	-4.9	.560
37	3.00	9.6	1.32	2.6	-7.0	.440
40	4.00	12.1	1.41	3.0	-9.1	.353
45	5.00	13.9	1.36	2.7	-11.2	.272
50	5.00	13.9	1.03	0.4	-13.5	.206

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Hamilton Kent 150 Isolator
Rated Load 150 lbs.
Test Load 147.6 lbs.
January 31, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
60	10.0	20.0	1.38	2.8	-17.2	.138
70	10.0	20.0	1.00	0.0	-20.0	.100
80	20.0	26.0	1.52	3.6	-22.4	.0760
90	20.0	26.0	1.28	2.2	-23.8	.0640
100	30.0	29.6	1.50	3.5	-26.1	.0500
130	40.0	32.1	1.10	0.9	-31.2	.0275
160	60.0	35.6	1.11	1.0	-34.6	.0185
200	100	40.0	1.08	0.7	-39.3	.0108
250	125	42.0	1.00	0.0	-42.0	.00800
300	111	41.1	1.00	0.0	-41.1	.00900
350	200	46.0	2.11	6.5	-39.5	.0106
400	340	50.7	1.00	0.0	-50.7	.00294
500	400	52.0	1.25	2.0	-50.0	.00312
600	310	50.0	.400	-8.0	-58.0	.00129
700	490	53.8	.470	-6.6	-60.4	.000960
800	660	56.5	.330	-10.5	-67.0	.000515
900	1110	61.0	.277	-11.2	-72.2	.000125
990	1160	61.4	1.00	0.0	-61.4	.000862
1100	198	45.9	1.00	0.0	-45.9	.00505
1200	48.0	33.6	1.00	0.0	-33.6	.0208
1500	86.0	38.6	.239	-12.5	-51.1	.00278
2100	325	50.4	1.00	0.0	-50.4	.00308
2700	660	56.5	1.40	3.0	-59.5	.00212
3000	1000	60.0	1.00	0.0	-60.0	.00100
4400	240	47.7	.385	-8.4	-56.1	.00160
4820	1000	60.0	1.46	3.4	-56.6	.00146
6520	770	57.8	3.55	11.0	-46.8	.00460
7200	190	44.6	.840	-1.5	-46.1	.00442
7500	225	47.0	.700	-2.1	-49.1	.00311
7700	248	47.9	3.30	10.2	-37.7	.0133

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Hamilton Kent 150 Isolator
Rated Load 150 lbs.
Test Load 147.6 lbs.
January 31, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	9.0
20	33.5
40	62.8
60	90.2
80	111.5
100	137.4
120	155.0
140	171.4
160	184.4
180	200.0
200	216.3

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

17.0 thousandths of an inch
10.0 after ½ minute
7.4 after 1 minute
6.8 after 1½ minutes
6.2 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -30 db and -28 db.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 C 32 Isolator
Rated Load 160-480 lbs.
Test Load 295.1 lbs.
February 20, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	10.4	11.2	0.8	1.08
4	10.4	11.2	0.8	1.08
6	9.4	11.2	1.7	1.19
8	7.3	11.2	3.8	1.54

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
10	1.00	0.0	1.75	4.8	4.8	1.73
12	1.00	0.0	2.75	8.8	8.8	2.75
13	.500	-6.0	1.810	5.1	11.1	3.62
14	.250	-12.0	1.60	4.1	16.1	6.40
15	.500	-6.1	2.46	7.8	13.9	4.92
16	.400	-7.9	1.87	5.4	13.3	4.675
17	.500	-6.1	1.38	2.9	9.0	2.76
18	.500	-6.1	.970	-0.2	5.9	1.94
19	1.00	0.0	1.46	3.3	3.3	1.48
20	1.00	0.0	1.16	1.4	1.4	1.16
21	2.00	6.0	1.78	4.9	-1.1	.890
22	2.00	6.0	1.47	3.4	-2.6	.735
24	2.00	6.0	1.19	1.6	-4.4	.595
27	3.00	9.6	1.29	2.3	-7.3	.430
30	5.00	13.9	1.58	3.9	-10.0	.316
35	6.00	15.6	1.32	2.5	-13.1	.220
40	8.00	16.2	1.29	2.3	-13.9	.161
45	10.0	20.0	1.22	1.8	-18.2	.122
50	20.0	26.0	2.00	6.0	-20.0	.100
60	20.0	26.0	1.38	2.8	-24.2	.0690
70	100	40.0	4.78	13.6	-26.4	.0478
80	100	40.0	3.62	11.2	-28.8	.0362
91	100	40.0	2.83	9.1	-30.9	.0283
100	50.0	33.9	1.17	1.5	-32.4	.0234
125	100	40.0	1.49	3.5	-36.5	.0149
150	98.5	39.9	1.00	0.0	-39.9	.0102
200	91.5	39.3	.444	-7.0	-46.3	.00478

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 C 32 Isolator
Rated Load 160-480 lbs.
Test Load 295.1 lbs.
February 20, 1950

Frequency cps	Accelerometer Readings				db change	Transmissibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
250	396	52.0	1.00	0.0	-52.0	.00252
300	166	44.3	1.00	0.0	-44.3	.00602
350	430	52.8	1.00	0.0	-52.8	.00232
400	248	47.9	.400	-7.9	-47.9	.00161
450	223	47	.316	-10	-57.0	.00141
500	209	46.4	.186	-14.7	-61.1	.000890
532	212	46.1	.730	-2.7	-49.3	.00343
560	299	49.5	.211	-13.5	-63.0	.000706
600	312	49.9	.200	-13.3	-63.2	.000640
700	428	52.7	.282	-11.0	-63.7	.000655
860	820	58.3	.500	-6.1	-64.4	.000610
890	316.	50.0	.545	-5.3	-55.3	.00173
912	98.2	39.9	1.00	0.0	-39.9	.0102
930	177	44.8	2.00	6.0	-38.8	.0113
950	316	50.0	2.00	6.0	-44.0	.00635
980	540	54.6	1.00	0.0	-54.6	.00185
1175	209	46.4	.500	-6.1	-52.5	.00239
1400	250	48.0	.475	-6.5	-54.5	.00190
1600	82.0	38.3	.500	-6.1	-44.1	.00310
2000	166	44.4	.396	-8.0	-52.4	.00236
2830	1000	60.0	.382	-8.3	-68.3	.000382
3120	2000	66.0	.110	-19.0	-85.0	.0000550
6340	473	53.5	1.00	0.0	-53.5	.00211
6650	1260	62.1	.620	-4.1	-66.2	.000490
7700	74.5	37.5	2.50	8.0	-29.5	.0336

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 508 C 32 Isolator
Rated Load 160-480 lbs.
Test Load 295.1 lbs.
February 20, 1950

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0
5	1
100	28.0
200	61.2
300	100.9
400	145.5
500	197.0
600	231.6

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

7.5 thousandths of an inch
6.1 after ½ minute
5.8 after 1 minute
5.5 after 1½ minutes
5.2 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -20 db and -22 db.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 510 C 32 Isolator
Rated Load 160-480 lbs.
Test Load 295.1 lbs.
March 7-10, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	7.5	9.1	1.7	1.21
4	8.3	10.4	2.0	1.25
6	9.0	10.8	1.6	1.20
8	5.4	9.3	4.8	1.72
10	4.3	9.7	7.1	2.25

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
12	.375	-8.5	2.20	6.9	15.4	5.87
13	.520	-5.6	1.80	5.1	10.7	3.46
14	.520	-5.6	1.30	2.4	8.0	2.50
15	1.00	0.0	1.84	5.3	5.3	1.84
16	.720	-2.8	.900	-0.9	3.7	1.25
17	1.00	0.0	1.15	1.5	1.5	1.15
18	2.00	6.0	1.98	5.8	-0.2	.990
19	1.15	1.5	1.00	0.0	-1.5	.870
20	1.00	0.0	.760	-2.4	-2.4	.760
22	2.00	6.0	1.10	1.0	-5.0	.550
24	4.70	13.4	2.00	6.0	-7.4	.425
26	5.75	15.1	2.00	6.0	-9.1	.348
30	10.0	20.0	2.80	9.0	-11.0	.280
40	10.0	20.0	1.40	3.1	-16.9	.140
50	20.0	26.0	1.80	5.1	-20.9	.0900
60	20.0	26.0	1.18	1.6	-24.4	.0590
80	40.0	32.1	1.32	2.6	-29.5	.0330
90	40.0	32.1	1.06	0.6	-31.5	.0265
100	100	40.0	2.20	6.7	-33.3	.0220
125	100	40.0	1.45	3.3	-36.7	.0145
150	65.0	36.4	.710	-3.0	-39.4	.0109
175	26.0	28.4	.220	-13.1	-41.5	.00846
185	110	41.0	.680	-3.4	-44.4	.00616
200	235	47.4	1.00	0.0	-47.4	.00426
221	510	54.1	1.70	4.6	-49.5	.00334
250	860	58.7	2.00	6.0	-52.7	.00233
261	600	55.6	1.00	0.0	-55.6	.00167

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 510 C 32 Isolator
Rated Load 160-480 lbs.
Test Load 295.1 lbs.
March 7-10, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
300	500	54.0	3.16	10.0	-44.0	.00632
335	129	42.3	.440	-7.1	-49.4	.00341
350	380	51.6	1.00	0.0	-51.6	.00263
372	290	49.4	.650	-3.6	-53.0	.00224
400	172	44.7	.316	-10.0	-54.7	.00184
430	316	50.0	.550	-5.4	-55.4	.00174
450	260	48.3	.450	-6.9	-55.2	.00173
500	316	50.0	.385	-8.4	-58.4	.00122
550	270	48.6	.310	-10.1	-58.7	.00115
600	316	50.0	.300	-10.4	-60.4	.000950
700	720	57.2	.316	-10.0	-67.2	.000440
800	112	41.1	.250	-12.0	-53.1	.00223
900	69.0	36.8	1.00	0.0	-36.8	.0145
1500	159	44.0	.225	-13.0	-57.0	.00142
2000	64.0	36.2	.710	-3.0	-39.2	.0111
2400	241	47.7	.800	-1.8	-49.5	.00332
6460	160	44.1	.890	-1.0	-45.1	.00555
7720	316	50.0	.350	-8.9	-58.9	.00111
7840	208	46.4	2.66	8.5	-37.9	.0122

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	2.0
100	31.5
200	67.9
300	109.1
400	156.2
500	209.9

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 510 C 32 Isolator
Rated Load 160-480 lbs.
Test Load 295.1 lbs.
March 7-10, 1950

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

2.1 thousandths of an inch
0.9 after $\frac{1}{2}$ minute
0.3 after 1 minute
0.2 after $1\frac{1}{2}$ minute
0.1 after 2 minutes.

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -20 db and -26 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 510 C 38 Isolator
Rated Load 190-570 lbs.
Test Load 295.1 lbs.
March 13, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	9.2	10.0	0.8	1.08
4	9.7	11.6	1.7	1.20
6	8.3	10.5	2.1	1.27
8	5.9	9.8	4.3	1.66

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
9	1.00	0.0	1.77	4.9	4.9	1.77
10	1.00	0.0	2.16	6.7	6.7	2.16
11	1.00	0.0	2.88	9.2	8.2	2.86
12	.790	-2.0	2.88	9.2	11.2	3.65
13	.500	-6.1	2.24	7.0	13.1	4.48
13.5	.500	-6.1	2.24	7.0	13.1	4.48
14	.500	-6.1	2.24	7.0	13.1	4.48
16	.500	-6.1	1.80	5.1	11.2	3.60
17	.500	-6.1	1.27	2.2	8.3	2.54
18	.500	-6.1	1.08	0.8	6.9	2.16
19	.500	-6.1	.840	-1.5	4.6	1.68
20	1.00	0.0	1.30	2.4	2.4	1.30
21	1.00	0.0	1.70	0.7	0.7	1.07
22	1.00	0.0	.910	-0.8	-0.8	.910
23	1.00	0.0	.810	-1.8	-1.8	.810
25	2.00	6.0	1.14	1.3	-4.7	.560
30	3.00	9.6	1.05	0.2	-9.4	.350
35	5.00	13.9	1.23	1.9	-12.0	.246
40	10.0	20.0	1.70	4.6	-15.4	.154
45	20.0	26.0	2.53	8.2	-19.8	.126
50	20.0	26.0	2.12	6.6	-19.4	.106
60	20.0	26.0	1.41	3.1	-22.9	.0705
64	100	40.0	5.50	14.8	-25.2	.0550
66.6	400	52.1	18.4	25.3	-26.8	.0460
70	20.0	26.0	1.04	0.4	-25.6	.0520
80	30.0	29.6	1.16	1.3	-28.3	.0386
92	50.0	33.9	1.43	3.2	-30.7	.0286

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 510 C 38 Isolator
Rated Load 190-570 lbs.
Test Load 295.1 lbs.
March 13, 1950

Frequency cps ***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
100	50.0	33.9	1.22	1.8	-32.0	.0244
125	100	40.0	1.57	3.9	-36.1	.0157
146	100	40.0	1.05	0.5	-39.5	.0105
183	100	46.0	1.26	2.2	-43.8	.0126
211	250	48.0	1.20	1.7	-46.3	.00480
250	500	53.9	1.37	2.8	-51.1	.00274
280	400	52.2	1.00	0.0	-52.2	.00250
290	200	46.0	1.00	0.0	-46.0	.00500
300	200	46.0	1.37	2.7	-43.3	.00685
310	400	52.1	1.28	2.2	-49.9	.00320
350	400	52.1	1.10	1.0	-51.1	.00275
400	300	49.6	.575	-4.8	-54.4	.00192
450	300	49.6	.505	-6.0	-55.6	.00168
500	300	49.6	.355	-9.0	-58.6	.00118
526	300	49.6	1.16	1.3	-48.3	.00038
600	216	46.7	.200	-14.0	-60.7	.000925
700	342	50.8	.200	-14.0	-64.8	.000585
800	137	42.8	.395	-6.0	-48.8	.00288
850	200	46.0	1.10	1.0	-45.0	.00550
900	75.5	37.6	1.00	0.0	-37.6	.0133
955	100	40.0	1.22	1.8	-38.2	.0122
1000	250	48.0	.870	-1.2	-49.2	.00348
1200	748	57.5	.250	-12.0	-69.5	.000334
1300	350	50.9	.445	-7.0	-57.9	.00127
1400	400	52.1	.545	-5.3	-57.4	.00135
1500	179	45.0	.355	-9.0	-54.0	.00198
2000	100	40.0	.790	-2.0	-42.0	.00790
2500	615	55.8	.200	-14.0	-69.8	.000326
2800	935	59.5	.146	-16.7	-76.2	.000156
4620	600	55.6	.257	-11.8	-67.4	.000430
5250	63.5	36.1	.128	-17.7	-53.8	.00202
5400	168	44.4	.233	-12.7	-57.1	.00139
6000	148	43.3	.260	-11.7	-55.0	.00175
6100	400	52.1	1.38	2.8	-49.3	.00345
6200	1000	60.0	5.72	15.1	-44.9	.00572
6300	500	53.9	5.25	14.4	-39.5	.0105
6400	110	41.0	.640	-3.8	-44.8	.0580

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -17.5 db and -28 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 510 C 38 Isolator
Rated Load 190-570 lbs.
Test Load 295.1 lbs.
March 13, 1950

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
6600	452	53.2	.566	-5.0	-58.2	.00125
7300	225	47.0	.730	-2.7	-49.7	.00324
7400	50.0	33.9	3.20	10.2	-23.7	.0640
7540	500	53.9	5.70	15.2	-38.7	.0114
7600	282	49.0	1.90	5.6	-43.4	.00675
7800	97.0	39.8	.520	-5.7	-45.5	.00536
8000	36.5	31.3	.440	-7.1	-38.4	.0121
8200	15.6	23.8	.270	-11.3	-35.1	.0173
10,300	23.8	27.5	.680	-3.3	-30.8	.0285

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
10	1.3
100	21.4
200	47.8
300	77.1
400	109.7
500	144.9
600	183.3
700	226.3
800	270.1
850	293.8

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

1.5 thousandths of an inch
0.8 after ½ minute
0.5 after 1 minute
0.3 after 1½ minutes
0.3 after 2 minutes.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 510 C 38 Isolator
Rated Load 190-570 lbs.
Test Load 397.1 lbs.
March 14, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmissibility
2	13.3	14.3	0.8	1.08
4	9.5	11.5	1.8	1.21
6	7.7	11.4	3.4	1.48

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
7	1.00	0.0	1.90	5.6	5.6	1.90
8	1.00	0.0	2.30	7.3	7.3	2.30
8.2	1.00	0.0	2.34	7.3	7.3	2.34
9	1.00	0.0	2.36	7.4	7.4	2.36
10	.580	-4.6	1.80	5.1	9.7	3.10
11	.350	-9.1	1.70	4.6	13.7	4.86
12	.300	-10.4	1.70	4.6	15.0	5.66
12.25	.355	-9.0	1.80	5.1	14.1	5.07
13	.420	-7.4	1.68	4.5	11.9	4.00
14	.500	-6.1	1.50	3.5	9.6	3.00
15	1.00	0.0	1.79	5.0	5.0	1.79
16	1.00	0.0	1.55	3.8	3.8	1.55
17	1.00	0.0	1.15	1.4	1.4	1.15
18	1.00	0.0	1.05	0.5	0.5	1.05
19	1.25	2.0	1.00	0.0	-2.0	.800
20	2.00	6.0	1.40	3.0	-3.0	.700
21	2.00	6.0	1.18	1.6	-4.4	.590
23	2.50	8.0	1.11	1.0	-7.0	.444
25	3.00	9.6	1.10	0.9	-8.7	.366
30	10.0	20.0	2.28	7.1	-12.9	.228
35	6.60	16.4	1.00	0.0	-16.4	.152
40	9.00	19.1	1.00	0.0	-19.1	.111
45	41.0	32.4	3.50	10.9	-21.5	.0854
50	30.0	29.6	2.20	6.9	-22.7	.0714
60	26.5	28.5	1.30	2.4	-26.1	.0491
70	225	47.0	7.90	18.0	-29.0	.0351
80	420	52.5	10.0	20.0	-32.5	.0238
90	67.0	36.5	1.29	2.2	-34.3	.0193

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

MB 510 C 38 Isolator
Rated Load 190-570 lbs.
Test Load 397.1 lbs.
March 14, 1950

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
100	110	41.0	1.95	5.8	-35.2	.0177
125	100	40.0	1.15	1.5	-38.5	.0115
147	200	46.0	1.35	2.8	-43.2	.00675
180	130	42.4	.690	-3.3	-45.7	.00531
200	210	46.5	.850	-1.4	-47.9	.00405
225	1000	60.0	2.75	8.8	-51.2	.00275
250	980	59.9	1.59	4.0	-55.9	.00162
270	760	57.5	.910	-0.8	-58.3	.00120
280	640	56.1	.490	-6.3	-62.4	.000766
290	579	55.2	.720	-2.9	-58.1	.00124
300	530	54.5	1.00	0.0	-54.5	.00189
325	440	53.0	2.00	6.8	-46.2	.00500
350	435	52.9	1.30	2.4	-50.5	.00299
400	281	49.0	.470	-6.5	-55.5	.00167
450	265	48.5	.460	-6.7	-55.2	.00174
500	270	48.6	.249	-12.1	-60.7	.000922
550	260	48.4	.220	-13.2	-61.6	.000845
600	290	49.3	.220	-13.2	-62.5	.000758
700	420	52.3	.260	-11.6	-63.9	.000619
800	89.0	39.0	.400	-7.9	-46.9	.00450
820	265	48.5	.325	-9.7	-58.2	.00123
900	151	43.6	.395	-8.0	-51.6	.00262
1000	250	48.0	.980	-0.2	-48.2	.00392
1300	1000	60.0	1.32	2.6	-57.4	.00132
1500	250	48.0	.600	-4.4	-52.4	.00240
2000	80.0	38.1	.350	-9.1	-47.2	.00437
2500	1000	60.0	9.00	19.0	-41.0	.00900
2800	1200	61.7	.560	-3.1	-64.8	.000466
5060	213	46.7	.630	-4.0	-50.7	.00296
5350	111	41.0	.460	-6.7	-47.7	.00414
5800	335	50.6	.480	-6.4	-57.0	.00143
6400	250	48.0	.700	-3.1	-51.1	.00280
6850	310	49.9	4.45	13.0	-36.9	.0143
7500	200	46.0	4.35	12.8	-33.2	.0218
7900	260	48.4	.840	-1.5	-49.9	.00323

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -24 db and -26 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier systems.

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Korfund ER/D4 Isolator
Rated Load 160-560 lbs.
Test Load 295.1 lbs.
March 3, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmis-sibility
2	8.8	9.0	0.2	1.02
4	9.1	9.6	0.6	1.06
6	9.0	9.8	0.9	1.09
8	8.3	9.4	1.2	1.13

Frequency cps***	Accelerometer Readings Driver Millivolts	db	Weight Millivolts	db	db change	Transmis-sibility
10	2.00	6.0	2.42	7.7	1.7	1.21
12	2.00	6.0	2.67	8.5	2.5	1.33
14	2.00	6.0	2.86	9.1	3.1	1.43
16	1.00	0.0	1.55	3.6	3.6	1.55
18	1.00	0.0	6.06	6.3	6.3	2.06
20	.500	-6.1	1.23	1.9	8.0	2.46
21	.630	-4.0	1.84	5.3	9.3	2.92
22	.500	-6.0	1.77	4.8	10.8	3.54
23	.400	-7.9	1.73	4.7	12.6	4.33
24	.350	-11.1	1.79	5.0	16.1	5.12
25	.300	-10.4	1.41	3.0	13.4	4.70
26	.300	-10.4	1.34	2.7	13.1	4.47
27	.300	-10.4	1.16	1.3	11.7	3.87
28	.300	-10.4	.980	-0.1	10.3	3.27
29	.400	-7.9	1.00	0.0	7.9	2.50
30	1.00	0.0	2.09	6.4	6.4	2.09
31	1.00	0.0	1.83	5.3	5.3	1.83
32	1.00	0.0	1.61	4.1	4.1	1.61
33	1.00	0.0	1.38	2.8	2.8	1.38
34	1.00	0.0	1.21	1.7	1.7	1.21
35	1.00	0.0	1.13	1.2	1.2	1.13
36	1.50	3.5	1.43	3.2	-0.3	.953
37	1.50	3.5	1.27	2.2	-1.3	.847
38	1.50	3.5	1.22	1.8	-1.7	.813
39	1.50	3.5	1.13	1.2	-2.3	.753
40	1.50	3.5	1.01	0.2	-3.3	.674
45	2.50	8.0	1.17	1.4	-6.6	.468
50	3.00	9.6	1.09	0.8	-8.8	.363
60	7.60	17.6	1.60	4.0	-13.6	.211
70	10.0	20.0	1.53	3.7	-16.3	.153

Test Data
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Korfund ER/D4 Isolator
Rated Load 160-560 lbs.
Test Load 295.1 lbs.
March 3, 1950

Frequency cps*	Displacements,** of Driver,	Weight	Equivalent db change	Transmissibility
2	8.8	9.0	0.2	1.02
4	9.1	9.6	0.6	1.06
6	9.0	9.8	0.9	1.09
8	8.3	9.4	1.2	1.13

Frequency cps***	Accelerometer Readings: Driver Millivolts	db	Weight Millivolts	db	db change	Transmissibility
10	2.00	6.0	2.42	7.7	1.7	1.21
12	2.00	6.0	2.67	8.5	2.5	1.33
14	2.00	6.0	2.86	9.1	3.1	1.43
16	1.00	0.0	1.55	3.6	3.8	1.55
18	1.00	0.0	6.06	6.3	6.3	2.06
20	.500	-6.1	1.23	1.9	8.0	2.46
21	.630	-4.0	1.84	5.3	9.3	2.92
22	.500	-6.0	1.77	4.8	10.8	3.54
23	.400	-7.9	1.73	4.7	12.6	4.33
24	.350	-11.1	1.79	5.0	16.1	5.12
25	.300	-10.4	1.41	3.0	13.4	4.70
26	.300	-10.4	1.34	2.7	13.1	4.47
27	.300	-10.4	1.16	1.3	11.7	3.87
28	.300	-10.4	.980	-0.1	10.3	3.27
29	.400	-7.9	1.00	0.0	7.9	2.50
30	1.00	0.0	2.09	6.4	6.4	2.09
31	1.00	0.0	1.83	5.3	5.3	1.83
32	1.00	0.0	1.61	4.1	4.1	1.61
33	1.00	0.0	1.38	2.8	2.8	1.38
34	1.00	0.0	1.21	1.7	1.7	1.21
35	1.00	0.0	1.13	1.2	1.2	1.13
36	1.50	3.5	1.43	3.2	-0.3	.953
37	1.50	3.5	1.27	2.2	-1.3	.847
38	1.50	3.5	1.22	1.8	-1.7	.813
39	1.50	3.5	1.13	1.2	-2.3	.753
40	1.50	3.5	1.01	0.2	-3.3	.674
45	2.50	8.0	1.17	1.4	-6.6	.468
50	3.00	9.6	1.09	0.8	-8.8	.363
60	7.60	17.6	1.60	4.0	-13.6	.211
70	10.0	20.0	1.53	3.7	-16.3	.153

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Korfund ER/D4 Isolator
Rated Load 160-560 lbs.
Test Load 295.1 lbs.
March 3, 1950

Frequency cps***	Accelerometer Readings				db change	Transmis-sibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
80	10.0	20.0	1.14	1.3	-18.7	.114
90	15.0	23.5	1.17	1.4	-22.1	.0781
100	20.0	26.0	1.40	2.9	-23.1	.0700
130	30.0	29.6	1.23	1.8	-27.8	.0408
160	50.0	33.9	1.27	2.1	-31.8	.0254
200	80.0	38.2	1.28	2.2	-36.0	.0160
250	150	43.5	1.37	2.8	-40.7	.00914
280	200	46.0	1.17	1.4	-44.6	.00585
300	100	40.0	1.40	2.7	-37.3	.0140
325	200	46.0	1.84	5.3	-40.7	.00920
350	200	46.0	1.48	3.4	-42.6	.00740
375	200	46.0	1.18	1.6	-44.4	.00590
400	300	49.6	1.40	3.0	-46.6	.00467
450	300	49.6	1.05	0.5	-49.1	.00350
500	202	46.1	.500	-6.1	-52.2	.00248
600	275	48.7	.500	-6.1	-54.8	.00182
700	255	48.2	.300	-10.4	-58.6	.00118
900	300	49.6	1.08	0.8	-48.8	.00360
950	50.0	33.9	1.04	0.3	-30.9	.0280
1000	121	41.8	.700	-3.1	-44.9	.00578
1100	167	44.4	.200	-14.0	-58.4	.00120
1200	664	56.5	.500	-6.1	-62.6	.000754
1300	736	57.3	1.00	0.0	-57.3	.00136
1400	297	49.5	.800	-1.8	-51.3	.00269
1500	138	42.8	.680	-3.3	-46.1	.00493
1600	153	43.7	1.00	0.0	-43.7	.00654
1700	152	43.6	1.00	0.0	-43.6	.00658
1800	174	44.8	.885	-1.1	-45.9	.00509
1900	100	40.0	1.00	0.0	-40.0	.0100
2000	89.0	39.0	1.00	0.0	-39.0	.0112
2100	69.2	36.8	.550	-5.2	-42.0	.00795
2200	78.0	37.5	.500	-6.1	-43.6	.00642
2400	57.5	35.2	.300	-10.4	-45.6	.00522
2560	450	51.0	.550	-5.2	-56.2	.00122
3000	430	52.8	.475	-6.5	-59.3	.00110
3150	880	58.9	.970	-0.2	-59.1	.00110
4000	145	43.4	.450	-7.0	-50.4	.00310

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Korfund ER/D4 Isolator
Rated Load 160-560 lbs.
Test Load 295.1 lbs.
March 3, 1950

Frequency cps***	Accelerometer Readings				db change	Transmissibility
	Driver		Weight			
	Millivolts	db	Millivolts	db		
4500	250	48.0	1.89	5.4	-42.6	.00756
4600	380	51.5	4.10	12.4	-39.1	.0108
5000	70.0	37.0	1.20	1.6	-35.4	.0172
6400	235	47.5	13.0	22.4	-25.1	.0554
6600	230	47.4	.540	-5.4	-52.8	.00235
7000	920	59.4	3.10	9.9	-49.5	.00337
7100	1990	65.9	8.00	18.1	-47.8	.00402
7800	110	41.0	1.05	0.5	-40.5	.00955
9100	2.10	6.5	.350	-9.0	-15.5	.167

Static Test Data

Load in pounds	Deflection in thousandths of an inch
0	0.0
5	3.0
50	29.5
100	49.2
150	65.3
200	78.3
250	90.0
300	102.8
350	114.0
400	126.0
450	135.5

Set Data

Maximum load was applied to the isolator for one minute; when the load was removed the set of the isolator was

17.0 thousandths of an inch
8.0 after ½ minute
6.3 after 1 minute
5.7 after 1½ minutes
5.1 after 2 minutes.

Test Data (cont'd)
Mechanical Engineering Department
Illinois Institute of Technology
Navy Contract N7-onr-32904

Korfund ER/D4 Isolator
Rated Load 160-560 lbs.
Test Load 295.1 lbs.
March 3, 1950

* Data obtained with two dial gages, one mounted to read the movement of the driving head, the other so as to read the movement of the weight.

** Displacements are given in thousandths of an inch double amplitude.

*** Data obtained with two crystal-type accelerometers. Driver and weight accelerometer noise levels, respectively -24 db and -28 db.

NOTE: Data obtained above 10,000 cps is questionable due to inherent electronic noise in the accelerometer and amplifier system.

Appendix F

Sample Calculations

Appendix F

Sample Calculations

Some of the dynamic characteristics of the mountings were computed as shown in the following paragraphs.

The dynamic stiffness k_{dy} of each isolator was computed at resonance from the relationship

$$k_{dy} = m\omega_{ra}^2 \qquad \text{(a)}$$

or in engineering units,

$$k_{dy} = 4\pi^2 f_{ra}{}^2 \frac{W}{g}$$

$$= 0.1023\, W f_{ra}{}^2 \qquad \text{(b)}$$

where W is the load on the isolator (lb.) and f_{ra} is the frequency of maximum forced amplitude (cps).

The static stiffness k_{st} of each isolator was computed by taking the tangent of the static load-deflection curve at the value of the test load, that is, referring to Figure III-6,

$$k_{st} = \tan\theta \qquad \text{(c)}$$

The ratio of dynamic to static stiffness γ is computed from equations (b) and (c), or

$$\gamma = k_{dy}/k_{st} \qquad \text{(d)}$$

The damping ratio ρ was computed from equation (6),

$$\epsilon = \sqrt{\frac{1 + 4\rho^2 r^2}{(1 - r^2)^2 + 4\rho^2 r^2}}$$

In this equation it was assumed that $r = 1$ at resonance, that is, that $\omega_{ra} = \omega_n$. Since the values of ρ are small, there is very little difference between ω_{ra} and ω_n (see equation (12) in Section III). Thus, a negligible error was introduced by this assumption and equation (6) becomes

$$\epsilon = \sqrt{\frac{1 + 4\rho^2}{4\rho^2}} \qquad \text{(e)}$$

from which

$$\rho = \frac{1}{2}\sqrt{\frac{1}{\epsilon_o^2 - 1}} \qquad \text{(f)}$$

where $\epsilon_o > 1$ at resonance. A plot of equation (f) is shown in Figure VI-F-1. Thus, if the transmissibility ϵ_o is known at resonance, ρ can be determined by equation (f) or Figure VI-D-1.

It should be noted that this equation is valid only insofar as the assumptions that were made are valid.

Consider resilient mounting 002B, an isolator made by Barry Manufacturing Co., type 236-10. A test load of 9.89 pounds was used. From the load deflection curve the static stiffness was determined, as defined in equation (c). This value was $k_{st} = 73.2$ lb/in. (See page 002B-a in Section VI, Appendix D.)

From the transmissibility curve (page 002B-b, Section VI, Appendix D) the maximum transmissibility was 7.38 at a resonant frequency of 12 cps. Thus by equation (b)

$$k_{1y} = 0.1023 \times 9.89 \times 12^2$$

$$= 145.7 \text{ lb/in.}$$

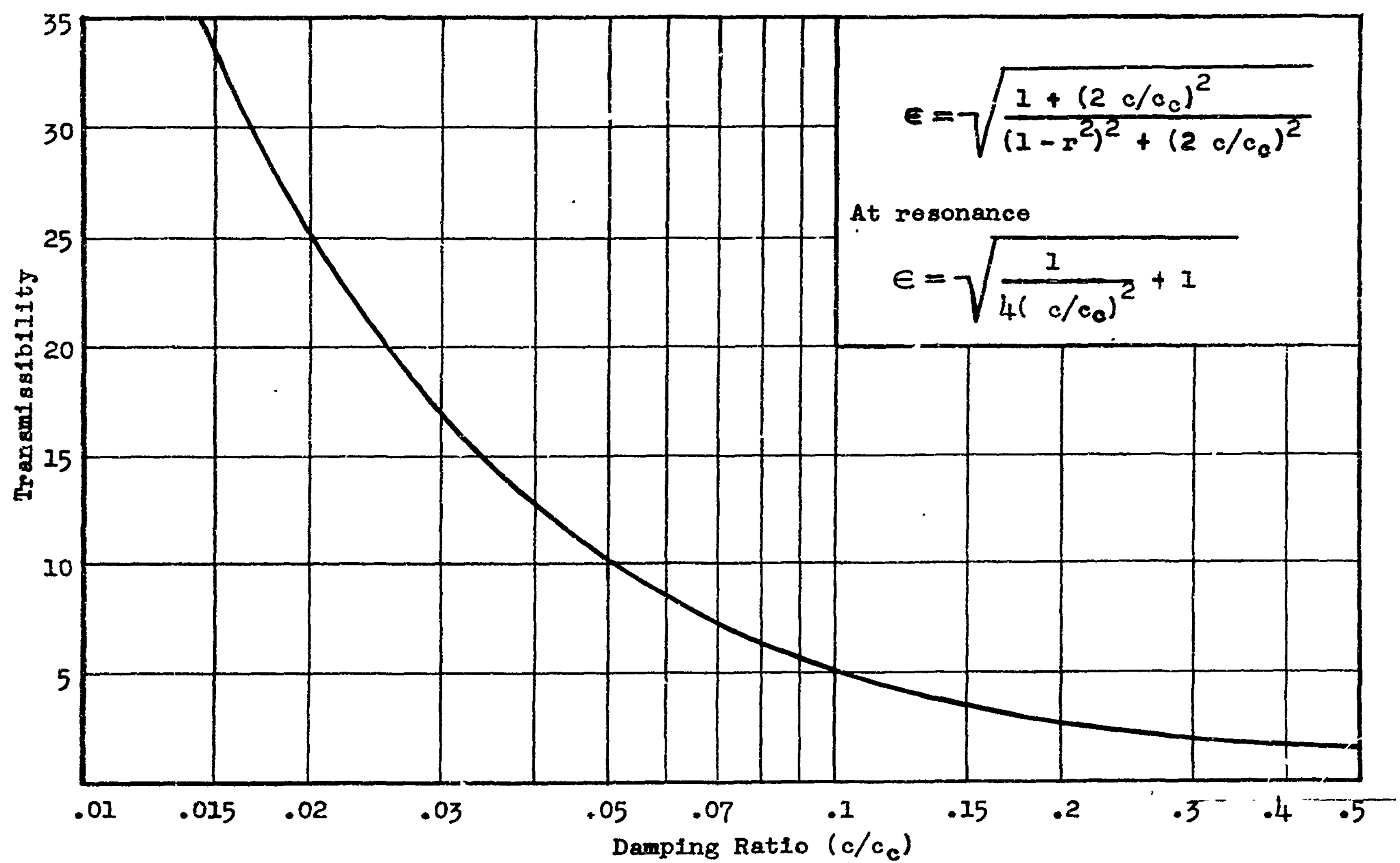


Figure VI-F-1
Effect of Damping upon Transmissibility at Resonance

By equation (d)

$$\gamma = \frac{145.7}{73.2}$$

$$= 1.99$$

By equation (f)

$$\rho = \frac{1}{2}\sqrt{\frac{1}{7.38^2 - 1}}$$

$$= 0.0680$$

Appendix G

Staff

Appendix G

Staff

Name	Title
Professor W. P. Green	Project Consultant

Professor Green received his bachelor's degree in mechanical engineering in 1931 at the University of Florida and his master's degree in mechanical engineering in 1936 from the same school. After serving two years as Junior Assistant Research Engineer at Arlington, Virginia, Professor Green accepted a position on the staff of the University of Maryland in the mechanical engineering department in charge of internal combustion engine research. He joined the staff of Illinois Institute of Technology in 1946 as professor of mechanical engineering in charge of internal combustion engine courses and the Engine Noise Research Program. He is also Head of the Engine and Lubricants section of the Armour Research Foundation.

Professor C. A. Arents	Project Director

Professor Arents is Assistant Dean of Engineering at Illinois Institute of Technology and is a specialist in the fields of applied mechanical vibrations, machine design, and electrical and heat power engineering. He received his bachelor's degree in electrical engineering in 1932 at Oregon State College and his master's degree in mechanical engineering in 1946 from the same school. He served

five years as Test Engineer for the city of Portland, Oregon, organizing, designing and testing automobile equipment; three years as Electrical Engineer for the Bonneville Power Administration writing and reviewing specifications on electric power equipment; three years at Oregon State College in charge of machine design in the Mechanical Engineering Department; and one year at Montana State College in charge of machine design and heat power engineering. Professor Arents joined the staff at Illinois Institute of Technology in 1947 as associate professor of Mechanical Engineering, teaching machine design, applied mechanical vibrations and heat power engineering. During the past seven years he has been active as a research engineer and a consultant in both mechanical and electrical engineering.

W. T. Allen   Associate Research Engineer

Mr. Allen received his bachelor's degree in mechanical engineering in 1939 from the University of Tennessee and his master's degree in mechanical engineering in 1940 from Columbia University. During the war he worked in the Aircraft Division of General Motors Corporation as a mechanical engineer and then in the guided missile control section of Lear, Inc., as an assistant project engineer. He joined the staff of Illinois Institute of Technology in 1948 to work on the present project.

D. F. Muster   Associate Research Engineer

Mr. Muster is a staff member in the Mechanics Department of

Illinois Institute of Technology. He was graduated from Marquette University in 1940 with a bachelor's degree in mechanical engineering, and received his master's degree in mechanical engineering from Illinois Institute of Technology in 1949. Concurrently with his research work on this and other projects, he is completing a doctorate in Mechanics.

O. E. Curth — Assistant Research Engineer

Mr. Curth served with the Navy as an Electronics Technicians Mate after completing a year of training in the Navy's electronics schools. After his discharge, he reentered Illinois Institute of Technology, from where he was graduated in 1949 with a bachelor's degree in mechanical engineering. Immediately after graduation he was employed by the Mechanical Engineering Department of the Institute to work upon this project. Concurrently with his work on this project he is completing his studies for a master's degree in mechanical engineering.

Respectfully submitted,

ILLINOIS INSTITUTE OF TECHNOLOGY
Mechanical Engineering Department

Douglas Muster

Douglas Muster
Associate Research Engineer

Chester A. Arents

Chester A. Arents
Project Director

APPROVED:

Wilson P. Green

Wilson P. Green
Project Consultant

Dated: 14 June 1950